MYCOLOGIA

VOL. X JULY, 1918 No. 4

ILLUSTRATIONS OF FUNGI—XXIX

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The smaller gill-fungi are usually difficult to determine because the species are numerous and lack conspicuous distinctive characters. Those shown on the accompanying plate, which is the work of Miss Eaton, represent *Marasmius, Prunulus, Gymnopus,* and other genera. None of them are large enough to be of economic importance. Specimens of *Marasmius* have been determined by Professor L. H. Pennington.

Prunulus viscidipes Murrill, sp. nov.

Mycena viscidipes Murrill

VISCID-STEMMED PRUNULUS

Plate 8. Figure 1. × 1

Pileus hemispheric to expanded, becoming somewhat depressed at the center, gregarious to subcespitose, 1–2 cm. broad; surface hygrophanous but not viscid, glabrous, distinctly striate, fuliginous on the disk, pale-avellaneous to almost white toward the entire, straight margin; context exceedingly thin, pallid; lamellae arcuate-subdecurrent behind, ventricose in front, pallid, entire; spores ellipsoid, smooth, hyaline, 6–7 × 4μ; stipe slightly tapering upward, dull-gray, glabrous above, tomentose below, very viscid, 4–5 cm. long, 1.5–2.5 mm. thick.

Type collected by W. A. Murrill among leaves and sticks on the ground in deciduous woods in the New York Botanical Garden, July 30, 1915. Known only from the type locality. This is a dainty little plant with brownish, striate pileus and viscid stipe. It seems to have a preference for oak leaves.

[MYCOLOGIA for May (10: 107–176) was issued June 7, 1918.]

Laccaria amethystea (Bull.) Murrill

AMETHYST LACCARIA

Plate 8. Figure 2. × 1

Pileus thin, broadly convex, umbilicate or centrally depressed, solitary or gregarious, 1.2–2.5 cm. broad; surface hygrophanous, brown or violaceous-brown when moist, grayish when dry, unpolished; lamellae subdistant, adnate or decurrent, violaceous, color more persistent than in the pileus; spores globose, verruculose, 8–10 μ; stipe slender, equal, flexuous, hollow, concolorous or paler, 2.5–5 cm. long, 2–4 mm. thick.

This beautifully colored plant occurs sparingly on damp ground in shaded places throughout eastern temperate North America and in Europe. The specimens figured were quite small, only half the usual size of the species, which has been considered by some a variety of *L. laccata*.

Leptoniella conica Murrill, sp. nov.

Leptonia conica Murrill

CONE-SHAPED LEPTONIELLA

Plate 8. Figure 3. × 1

Pileus conic, not fully expanding, gregarious to subcespitose, 1.5 cm. broad and 1 cm. high; surface glabrous, hygrophanous, very slightly striate, umbrinous, becoming fuliginous on drying; margin slightly paler, incurved when young, entire; context very thin, pallid, without odor but with a very sweet, farinaceous taste; lamellae adnexed, slightly ventricose, subcrowded, pale-rose-colored, concolorous and entire on the edges; spores oblong, decidedly angular, obliquely apiculate at the base, pale-rose-colored with a large shining nucleus, 10–12 × 5 μ; stipe slightly tapering upward, concolorous, smooth, glabrous except at the base, where it is finely whitish-mycelioid, solid or somewhat hollow, 4–5 cm. long, 2–3 mm. thick.

Type collected by W. A. Murrill in damp soil among sticks and leaves on the bank of the Bronx River in the New York Botanical Garden, July 27, 1915. Known only from the type locality.

Laccaria striatula Peck

STRIATULATE LACCARIA

Plate 8. Figure 4. × 1

Pileus very thin, submembranous, convex or nearly plane, gregarious, 12–20 mm. broad; surface glabrous, hygrophanous, buffred and striatulate when moist, grayish or pale-buff when dry; lamellae broad, distant, adnate, pale-flesh-colored; spores globose or subglobose, verruculose, 11–13 μ; stipe slender, equal, fibrous, hollow, concolorous, 1.5–3 cm. long, 1–2 mm. thick.

This species was described in the third volume of *Mycologia* as a form of *L. laccata*. It occurs in damp places in the northeastern United States. The specimens here figured were collected in July, 1915, on a mossy bank in the New York Botanical Garden.

Prunulus galericulatus (Scop.) Murrill

Mycena galericulata (Scop.) Quél.

SHIELD-SHAPED PRUNULUS

Plate 8. Figure 5. × 1

Pileus submembranous, conic-campanulate to expanded, cespitose, 2–6 cm. broad; surface pale-grayish to grayish-brown, dry, glabrous; margin striate to the umbo; lamellae interveined, adnate with a decurrent tooth, white or flesh-colored; spores sphaeroid, hyaline, 8–10 × 4–6 μ; stipe rigid, smooth, polished, glabrous, tomentose at the base, white, yellowish, or brownish, the base fusiform, radicate, 5–10 cm. long.

A densely clustered species very common on logs and stumps in the northeastern United States as far west as the Rocky Mountains. It is one of the best known species in this difficult genus. About New York, it occurs abundantly on old oak and chestnut stumps.

Omphalopsis fibula (Bull.) Murrill

Omphalia fibula (Bull.) Quél.

PIN-SHAPED OMPHALOPSIS

Plate 8. Figure 6. × 1 and × 2

Pileus membranous, commonly convex or hemispheric and umbilicate, rarely conic, 3–20 mm. broad; surface glabrous, hygrophanous, striatulate when moist and varying in color from

orange to pale-yellow, sometimes with darker center, even and paler when dry; lamellae distant, arcuate, strongly decurrent, white or yellowish; spores ellipsoid, smooth, 4–6 × 2–3 μ; cystidia 35–40 × 7–8 μ; stipe long, slender, subconcolorous, glabrous, 2.5–5 cm. long, 0.5–2 mm. thick.

This little yellow agaric occurs commonly among moss in damp places and may be found from Canada to the West Indies and west to Colorado and Honduras, as well as in Europe. The specific name refers to the very slender stipe, surmounted by the dainty cap, which suggests the head of some sort of pin.

Clitocybe farinacea Murrill

FARINACEOUS CLITOCYBE

Plate 8. Figure 7. × 1

Pileus convex, umbilicate, rather thin, gregarious, 2–3.5 cm. broad; surface smooth, glabrous, hygrophanous, very pale avellaneous; margin entire or undulate, concolorous, becoming inflexed and often crenate on drying; context thin, whitish, strongly farinaceous both in odor and taste; lamellae short-decurrent, determinate, arcuate, of medium distance when fresh but rather distant when dry; spores ovoid, smooth, hyaline, 6–8 × 3–5 μ; stipe equal, fleshy but more or less flexible, with a rather tough rind, pallid, smooth, pulverulent at the apex, nearly solid, 3–4 cm. long, 2–4 mm. thick.

Known only from the vicinity of New York City, where it occurs on rich soil in deciduous woods. The type specimens were found in the New York Botanical Garden in August, 1915. The taste of the fresh plants is extremely farinaceous.

Marasmius dichrous Berk. & Curt.

TWO-COLORED MARASMIUS

Plate 8. Figures 8 and 11. × 1

Pileus subfleshy, convex, at length plane or depressed, 2–4 cm. broad; surface not polished, dry, nearly smooth to rugose-striate, reddish or purplish-pallid to alutaceous, becoming brown in dried plants; lamellae adnate, often becoming nearly free, close, narrow in front, often crisped, pale-reddish; spores often guttulate, 8–10 × 4.5–5 μ; stipe short, hollow, thickened upward, reddish-pallid, brown, or dark-reddish-brown, pruinose or slightly pubescent at the subtuberculose base, 1–3 cm. long, 2 mm. thick.

This species occurs on twigs, bark, and wood in woods from New England to South Carolina and west to the Central States. The specimens figured were collected by W. A. Murrill in the New York Botanical Garden. Number 8 occurred on fallen sticks in deciduous woods, on July 29, 1915, and number 11 was found growing on the trunk of a living white willow, on August 9, 1915.

Marasmius insititius Fries

INSERTED MARASMIUS

Plate 8. Figure 9. × 1

Pileus membranous, convex to plane or subumbilicate, 6–12 mm. broad; surface not polished, pale-yellowish-brown, then whitish; margin becoming plicate-sulcate; lamellae unequal, simple, broadly adnate, distant, narrow in front, pallid; spores $4 \times 2.5\,\mu$ (Massee); stipe inserted, horny, hollow, reddish-brown, floccose-furfuraceous, 2–3 cm. long, 1 mm. thick.

This species is found on dead leaves and twigs from New York to North Carolina and west to Minnesota and Missouri; also in Europe. The specimens figured were collected on dead leaves in hemlock woods in the New York Botanical Garden, July 27, 1915, by W. A. Murrill.

NEW YORK BOTANICAL GARDEN.

STUDIES IN THE GENUS GYMNOSPORANGIUM—III. THE ORIGIN OF THE TELEUTOSPORE

B. O. Dodge

(With Plates 9–11)

The manner in which the teleutospores are formed in the rusts has been described by a number of authors, but our knowledge of the origin and development of the teleutospore in *Gymnosporangium* is based mainly on the work of Sappin-Trouffy,[1] Blackman,[2] and Reed and Crabill.[3] Blackman makes the following statement regarding the origin of the spores in *G. clavariaeforme:* "The teleutospores of this form are not borne on the mycelium but arise from comparatively rectangular cells which form a close-set layer on the surface of the mycelium at the points where the teleutospores are developed. . . . They are similar to the teleutospore-bearing cells described by Sappin-Trouffy for *G. Sabinae*. . . . Each of these cells gives origin to a number (not more than three or four) of narrow outgrowths which develop into the stalked two-celled teleutospores."

Reed and Crabill find that in *G. macropus* the teleutospore is formed by the budding of the upper cell of the pseudoparenchyma. "A layer of erect rectangular cells arises from this mycelial mass just beneath and perpendicular to the cortex. These cells elongate and their tips take on gradually the characters of the incipent teleutospores."

Weimer[4] has studied spore development in *G. macropus* and

[1] Sappin-Trouffy, P. Recherches histologiques sur la famille des Urédinées. La Botaniste **5**: 59–244. *f. 1–60.* 1896.

[2] Blackman, V. H. On the fertilization, alternation of generations and general cytology of the Uredineae. Ann. Bot. **18**: 323–373. *pl. 21–24.* 1904.

[3] Reed, H. S., and Crabill, C. H. The cedar rust diseases caused by *Gymnosporangium juniperi-virginianae* Schw. Virginia Agr. Exp. Sta. Tech. Bull. **9**: 1–106. *f. 1–23.* My 1915.

[4] Weimer, J. L. Three cedar rust fungi, their life histories and the diseases they produce. Cornell Agr. Exp. Sta. Bull. **390**: 509–549. *f. 136–157.* My 1917.

G. globosum and apparently agrees with Reed and Crabill regarding the first species. "From these stromatic layers the telispore stalks arise." Of *G. globosum* he says: "The telial horns are developed from a stromatic layer in the same manner as are those of *G. juniperi-virginianae*." Weimer's figure 156 shows a mature sorus of *G. clavipes*. At the margin teleutospores are figured arising directly from the outermost cells of the pseudoparenchyma.

If we use the term basal cell in the usual sense, that is, to designate the cell from which various spore forms take their origin, then, according to the authors cited above, the basal cell in the teleutospore sorus is the upper or terminal cell of the pseudoparenchyma or stromatic mass. The writer[5] has recently described the origin of the teleutospore in *G. transformans* and *G. fraternum* and has since studied this question in *G. macropus*, *G. globosum*, *G. clavariaeforme* and *G. nidus-avis*. In all of these species at least the true basal cell is not the upper cell in the chain but it is the penultimate cell from which the teleutospore arises by budding. In *G. transformans* and *G. fraternum* the upper cells increase in size considerably, lose their cytoplasm and nuclei by degeneration, and become mere bladdery sacs several times their original length, so that the epidermis is raised further and finally broken open. The penultimate cell then grows out through or between the buffer cells, forming a narrow bud from which the teleutospore is formed by further growth. In *G. transformans* the buds seem to grow up very quickly so that the formation and degeneration of the terminal cells may be overlooked. In *G. fraternum*, however, the buffer cells form a striking palisade layer which frequently extends clear across the sorus primordium.

MATERIAL AND METHODS

Some of the material used in these studies was obtained from plants artificially infected in the greenhouse. In most of the work material from naturally infected plants was also studied. It has

[5] Dodge, B. O. Studies in the genus *Gymnosporangium*—I. Notes on the distribution of the mycelium, buffer cells and the germination of the aecidiospore. Brooklyn Bot. Gard. Mem. 1: 128–140, *pl.* 1 × *f.* 1–5. My 1918.

been found that these rusts developed perfectly normally on plants kept in the greenhouse during the summer and placed in cold frames over winter. Very good results have been obtained by fixing extremely thin free-hand sections of material in Flemming's weaker fluid. It is necessary to orient the pieces accurately in order to avoid cutting oblique microtome sections of the buffer cells and teleutospore buds. Flemming's triple stain was used, and when the Orange G in concentrated aqueous solution is employed the buffer cells can be seen very distinctly; whereas if the other colors predominate, the walls of these large empty cells do not show up conspicuously. Sections were cut 10 μ thick.

GYMNOSPORANGIUM MACROPUS

Cedar apples were obtained from plants growing at Cold Spring Harbor, N. Y., November 30, 1917. The cedars were potted and some were placed in cold frames, others were kept in the greenhouse and two were planted in the garden. Galls from artificially infected cedars were also studied and R. C. Faulwetter sent me a large collection from Clemson College, S. C., in January.

Reed and Crabill (l. c.) describe in considerable detail the growth of the galls caused by this rust. They also studied the growth and appearance of the hyphae in their relation to cells and tissues of the host, and followed the development of the sorus from the early stages. My attention has been focused particularly on the method of the origin of the teleutospore and it is on this question in the main that I am unable to agree with Reed and Crabill. One or two other points may be noted, however. These authors had some difficulty in staining the mycelium to show cross-walls and nuclei of haustoria distinctly. I find that the septa appear very plainly in my preparations and the haustoria take a very delicate stain showing the single nucleus in each, or two nuclei when two are present. Neither do I find that the cortical layer is noticeably thicker over the pits in the galls at points where sori are to appear. Weimer believes that the formation of these pits is due to the inhibition of the growth of certain parenchyma cells by the fungus present, while at other points the cells continue to multiply so that depressions result. I find that the

parenchyma cells in the region between the pits are larger than are those beneath the depressions. This might bring about the formation of the pits. Pits are not formed in galls caused by *G. globosum*, and in most species of this genus the host cells with which the hyphae are associated are usually hypertrophied. In some cases pits are formed in galls before there is any massing of the mycelium in preparation for the formation of a sorus, and I have not noticed any great destruction or crushing of parenchyma cells of the host in early stages of sorus formation as stated by Reed and Crabill.

Hyphae were quite commonly present in the parenchyma of all parts of the galls fixed November 30, but they were in much greater abundance in the region beneath the depressions. In the least matured specimens the hyphae had just begun to push in between the outer and smaller parenchyma cells directly beneath the central part of a depression. Later stages show that these hyphae begin to branch (Pl. 9, Fig. 1) and become fairly definitely directed. The cells are slightly larger than the cells of the vegetative hyphae. Their nuclei are very conspicuous, both visible, lying on the long axis of the cell. Although the ends of the branches do not appear to be pushing strongly against the cork layer above, a small space now exists between the cork and the parenchyma of the host. As these hyphae branch and new cells are added, a quite definite loose palisade of radially directed hyphae is formed, the cells of which are somewhat longer than broad. The hyphal mass becomes more compact so that a pseudoparenchyma is formed with cells more or less rectangular or polyhedral in shape. The two nuclei now occupy various positions in the cells (Pl. 9, Figs. 2, 3). The upper cells grow against the cork layers and become somewhat flattened but they are usually slightly longer than the cells beneath. They soon begin to swell or elongate, their cytoplasm becomes more vacuolate and the nuclei take the safranin stain, while the nuclei of all the cells below take the gentian violet. The buffer cells finally become two or three times their original length and contain only a thin watery substance that is faintly colored with orange G. Their walls become thinner and thinner and finally disappear altogether. The

cork cells have been pushed up, crushed in or broken down. This disorganization may not be entirely due to pressure. The fungus evidently brings about some chemical changes in the suberized cells. After the buffer cells have lost their contents the cells below bud out, their nuclei move up to the base of the buds and divide. There are now two nuclei in the bud and two in the basal cell. A septum is formed at once. The young binucleated teleutospore bud grows comparatively slowly so that these stages are fairly abundant at the center of the young sorus (Pl. 9, Fig. 3). Buds may push out of the side of a basal cell (Pl. 9, Fig. 2) and later three or four buds may be formed from one cell. The cork layer is lifted up and broken open first at the central part of the pit. Mature spores are present when this slight swelling or blistering is first noticeable (Pl. 9, Fig. 4). The cells of the lower portion of the stromatic mass do not stain very readily, so that their nuclei do not appear distinctly. Reed and Crabill's diagram (l. c., Fig. 7) of a sorus, while it perhaps exaggerates somewhat, brings out the point that the spores push up rapidly from a region in the center of the depression, and further development peripherally is considerably retarded. The size of the papilla at the center of a depression in the gall determines roughly the diameter of the sorus as it emerges. At the center of the blister the cork cells, especially the innermost cells, are considerably disorganized and crushed in, and nearly mature spores have been formed. Near the margin many long two-nucleated spore buds are present. Buffer cells have disappeared in the whole region beneath the blister, but at its margin and immediately beyond for a short distance a different picture is presented. The cork cells have not been crushed in or lifted up so conspicuously, and buffer cells are plainly visible, fully elongated, and short buds, some without nuclei, are growing up from the basal cells. Figure 4 in plate 9 shows a portion of a young sorus at a time when the papilla is plainly visible but before the cork has been ruptured. The conditions near the margin of the blister are shown at the right in the figure. The sorus primordium ends rather abruptly just beyond. The diameter of the raised portion is about one half of the entire depression in this section. Figures 1 to 4 show the

general features of small portions at the center of young sori. Various stages in the degeneration of the terminal cells will be described in connection with the discussion of the next species, where the conditions are practically the same.

GYMNOSPORANGIUM GLOBOSUM

The best material was obtained at Cold Spring Harbor, November 30. The location of the primordia could not be determined definitely on this date, as the sori had not even begun to form. The rust was therefore allowed to develop further in the greenhouse until December 16. The young sori could then be located by the appearance of mound-like swellings over which the cork layer was tightly stretched. The covering was as yet unbroken. Sections of such a swelling showed a broadly elliptical sorus primordium, at the center of which teleutospore buds were plainly visible. Sori began to break through the surface about ten days later and by the middle of January the large telia had developed quite normally.

The cork layer covering the galls is somewhat thicker than we find in the galls caused by *G. macropus*. There are usually five to eight layers of irregular cork cells and the outer ones may be more strongly suberized. The parenchyma cells are well supplied with starch, and haustoria are present, although not in considerable numbers. There is usually a single nucleus in each haustorium. The earlier stages in the formation of the sorus are similar to those described in connection with the preceding species. There is a more pronounced massing of the hyphae and the pseudoparenchyma is more compact (Plate 10, Fig. 5).

In *G. globosum* the development of the sorus is evenly progressive. At the margin the hyphae are crowded in between the outer parenchyma cells, lifting up the cork layer slightly. Further in the pseudoparenchyma is well formed with terminal cells pushed up squarely against the cork layer. Figures 9 and 10 in plate 11 were drawn from different portions of a section through a sorus. Figure 9 shows the condition at the margin, which is abnormally high in this section, due to an irregularity in the gall. Figure 10 represents a more mature condition toward the center.

A great many different stages can be found in the two regions figured. The sorus has about reached its maximum width and very little marginal extension will occur. In the region at the left between *a* and *b* the growth of the hyphal mass has not been completed. At *b* the terminal cell appears to have begun to degenerate, to judge by the condition of its nuclei. The subterminal cell of this hypha is rather long for a basal cell and no doubt another cell will be cut off. From *c* to *d* terminal growth has been completed, so that the buffer cells can be recognized; they have begun to elongate and their nuclei are seen in the early stages of degeneration. In one cell the nuclei are breaking down. At *m* (below) the nuclei are degenerating without swelling. At *o*, *q* and *r* the degenerating nuclei look like poorly fixed division figures. There is a depression in the pseudoparenchyma at *f*, as though the cork cell above offered considerable resistance. The basal cells here are at a lower level. Growth certainly was not as vigorous at this point for some reason. At *q* and *r* very long buffer cells still persist in a region where spores are being matured. The whole primordium is quite a compact mass of cells wedged up under the cork.

Stages similar to those shown from *d* to *g* in the upper figure were found for a considerable distance along the section. A region in which most of the basal cells have begun to bud out is shown in the lower figure. At *h* the bud has pushed into the empty terminal cell. The nuclei have not yet begun to divide. At *p* two adjacent cells have somewhat longer buds and the nuclei are dividing conjugately. At *k* nuclear division has been completed and the four nuclei appear to lie well up in the tube. This bud is not within the buffer cell but is bent downward so that the septum if formed is not visible. At *i* there are two buds from the same cell, one of them is growing out between two buffer cells. Several other similar stages can be seen in the figure. The two nuclei are dividing in an older bud in the region near *s*, where two-celled buds and two-celled spores are also shown. The nuclei in the cells of the larger spore are just fusing. The cork layers above are not yet completely broken open at this point. Undoubtedly the further elongation of spore stalks will be a factor in completing the rupture.

With the gradual increase in size of the cells as we pass from the margin we find a corresponding enlargement of the nuclei, although there is considerable variation in this respect. At the margin the nuclei are small and spherical or elliptical in outline. Pear-shaped nuclei or nuclei with beak-like extensions are often found in the older cells. The terminal cells do not necessarily form a perfectly even layer. Some cells extend much beyond others. This is due to the inequality in the rate of growth, and perhaps to the fact that some of the cork cells give way more easily. The gall is often irregular in outline.

Having shown that the leaf forms of *Gymnosporangium* on *Chamaecyparis*, and the two cedar apple rusts on the red cedar develop their teleutospores from subterminal basal cells, we may next consider *G. clavariaeforme* which ordinarily inhabits the stem of the common juniper.

GYMNOSPORANGIUM CLAVARIAEFORME

Artificially infected junipers furnished the basis for the study of *G. clavariaeforme*. Sori in several stages of development were found January 17 in the stems of small plants ten days after they had been taken from the cold frame. The cork covering these young stems was not thick enough to cause any serious trouble in fixing or sectioning. Sappin-Trouffy and Blackman studied the origin of the teleutospore in this species and found as previously noted that the terminal cells of the hyphal mass give rise directly to buds from which spores will develop. A brief examination of my material was sufficient to show that such is not the case. The method of origin here is just the same as it is in the species which I have discussed above. The sori on the stem present very much the same picture as do those of *G. globosum* and it is unnecessary to go into details further than refer to figures 6 and 7 in plate 10 which show small portions of a young sorus, one near the margin, the other toward the center. In the first figure we see that the hyphae have pushed up against the cork layers, the end cells have become flattened and rectangular in shape. There is then the same characteristic elongation and degeneration of these terminal cells, and buds grow out from the

subterminal cells and form the teleutospores. Some of the young buds coming against the cork cells are bent sidewise or even downward because the cork layer has not as yet been sufficiently raised (Fig. 7). This figure shows three buds in which the two nuclei are dividing. As Blackman has published good figures of the later stages, no further study was made of spore formation.

GYMNOSPORANGIUM NIDUS-AVIS

The three stem forms, *G. nidus-avis, G. clavariaeforme,* and *G. clavipes* sometimes develop sori on the blades of leaves. A comparison of such leaf sori in the three species discloses interesting differences in the way in which the primordium develops. The first two species develop mycelium in all parts of the leaf, the hyphae ramifying among the wood cells. *G. clavariaeforme* causes a considerable enlargement or hyperplasia, *G. nidus-avis* induces some enlargement of individual cells of the leaf, but the total effect is not very striking. *G. clavipes* forms a sorus which is very superficial and the mycelium is very much localized.

The material that was used in the study of *G. nidus-avis* was taken from artificially infected plants, nos. 929 and 609, and from naturally infected plants where the sori develop on rather conspicuous gall-like mounds beneath the cork. The sorus is formed in much the same way as we found in *G. clavariaeforme*. The cork may be somewhat thicker in the specimens examined and the pseudoparenchyma even more extensively developed and compact. Figure 8, Pl. 10, shows the marginal region of a sorus, the main part of which had already developed mature spores. The terminal cells begin to degenerate before they elongate very much. Their nuclei are often smaller than are those of the basal cells at this stage. All cells of the primordium are more or less rectangular and are closely crowded together. At the right in the figure one basal cell has budded out laterally and another has pushed into the buffer cell. Other stages are similar to those described in the preceding species.

CONCLUSIONS

The origin of the teleutospores from the subterminal cells of the tissue composing the primordium has been shown to be a very

common method in this genus of the rusts. The hosts attacked by the six species studied represent three species and two genera of conifers. The epidermis of the leaves and young stems is rather heavily cutinized, and the galls or stems upon which the sori of some of the species develop are covered with layers of cork of considerable thickness. After the cork (or epidermis) has been lifted up or broken open and the pressure on the marginal hyphal mass has been removed we might expect to find that the later-formed spores (at the margin) arise directly from the terminal cells. If the terminal cell becomes disorganized in response to a particular need for some sort of space-making unit it would not be necessary for every terminal cell in the primordium to degenerate. It is sometimes difficult to ascertain just how the spores are formed at the margin of a nearly full-grown sorus. I have as yet found no evidence that they arise at any time from terminal cells. It is not expected, of course, that this rule will apply to all other species of *Gymnosporangium*.

If the terminal cell represents a morphological unit in the primordia of the rusts, a unit not a basal cell, but one having either the space-making function or some unknown function we ought to find such units in other genera. The presence of sterile tissue in the accidium primordium in addition to the sterile cells above the gametic cells has been noted by those who have studied this spore form. The morphological or phylogenetic significance of these peculiar cells certainly has not been overemphasized, and it would be interesting to know just to what extent space-making requirements could lead to degeneration of tissue in the primordia of all spore forms, uredo sori and spermogonia included.

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EXPLANATION OF PLATES

The drawings were made with the aid of the camera lucida. Zeiss No. 4 eyepiece and 1/12th oil immersion lens were used in making Figs. 1, 2, 4–8. No. 5 eyepiece was used for Figs. 3, 9 and 10. Reduction about one fourth for Plates 10 and 11 and about one third for Plate 9.

PLATE 9, *Gymnosporangium macropus*

Fig. 1. Beginning of a sorus primordium at the center of a depression or pit in the gall.

Fig. 2. Older stage. About one third of the primordium is shown here. Further extension is being made at the left. Degenerating terminal cells are shown at the center, and spore buds are pushing into or between buffer cells at the right. The nuclei are just dividing in one bud. The walls of the overlying cork cells at the right are being pushed in.

Fig. 3. At the center of another young sorus. Shows that some terminal cells disintegrate more quickly than others. The position of the nuclei in a young bud just prior to division can be seen at the left. The cork cells are very irregular and are somewhat distorted by pressure.

Fig. 4. A portion of an older sorus at the stage when the papilla is quite noticeable. Two cork cells (at the left) are completely broken up and spores are nearly mature. Two or three spores or spore buds arise from each basal cell. No traces of buffer cells can be seen. At the right of the cells bearing two-celled spores there are six or seven basal cells that bear spore buds in which the stalk cell of each has just been cut off. There are one or two buds having three cells. The next region shows two-nucleated buds and other buds just forming. Traces of buffer cell walls are now visible as mere lines. At the right in the figure the degenerating terminal cells are very distinct. This figure shows the conditions near the border of the blister-like swelling. Note the abrupt transition here, practically all stages in spore formation from those in which the terminal cells still possess nuclei to the stages where two-celled spores are completed.

PLATE 10

Fig. 5, *Gymnosporangium globosum*. The central portion of a young primordium. Terminal cells have elongated slightly but have not begun to degenerate. The nuclei are somewhat larger than are those in the primordium of *G. macropus*.

Fig. 6, *Gyymnosporangium clavariaeforme*. The region at the margin of a young sorus at the center of which spores are just beginning to form. The cells from which the spore buds arise are plainly at a lower level than the terminal cells at the left. The host cells contain masses of some deeply staining substance showing degeneration, but their nuclei appear to be quite normal. An haustorium is shown in one cell.

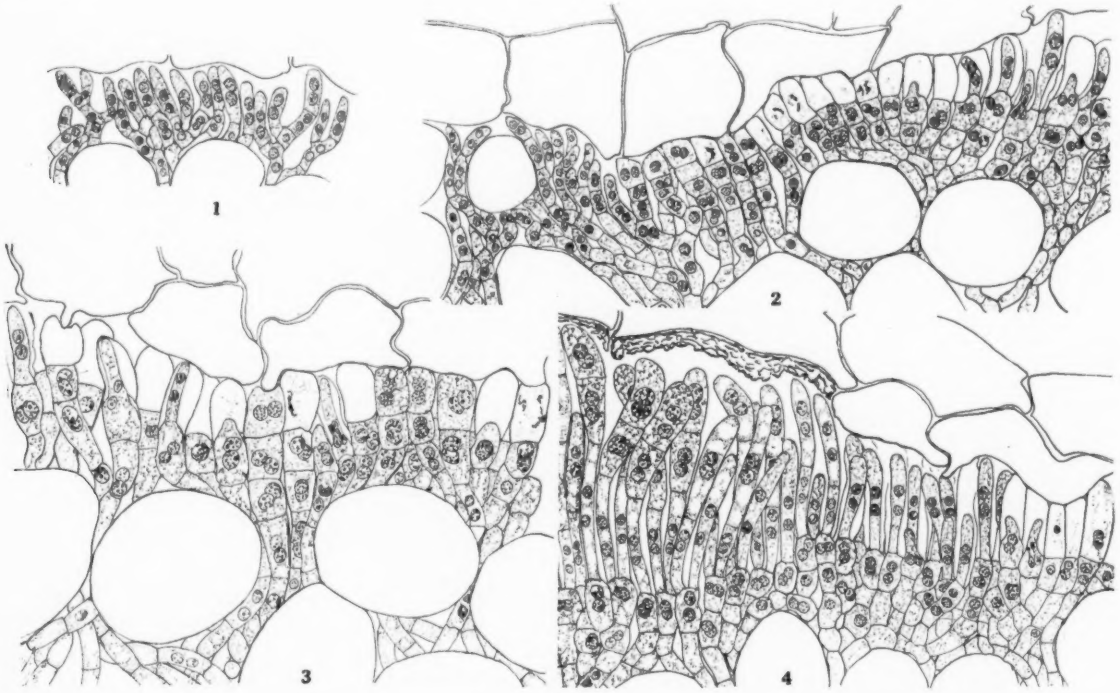
Fig. 7, *Gymnosporangium clavariaeforme*. Region at the center of a younger sorus. In one cell a bud is just forming. Nuclear division is occurring in the buds from three adjacent subterminal cells, one of which also has a bent two-nucleated lateral bud.

Fig. 8, *Gymnosporangium nidus-avis*. Near the margin of a large sorus on a naturally infected plant. Mature spores were present at the center and the cork had just been ruptured. There were about fifteen rows of flattened thick-walled cork cells above the region shown in the figure.

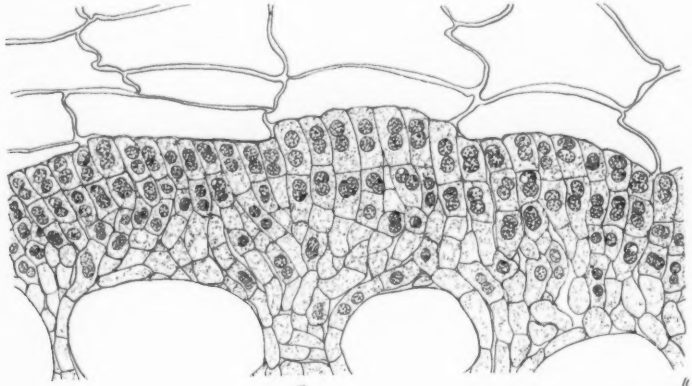
The nuclei of the terminal cells are small, and degeneration is not preceded by such an amount of elongation as occurs in the other species. A lateral bud and an internal spore bud are shown at the right. The nuclei of the cells of the pseudoparenchyma are rather large.

PLATE 11

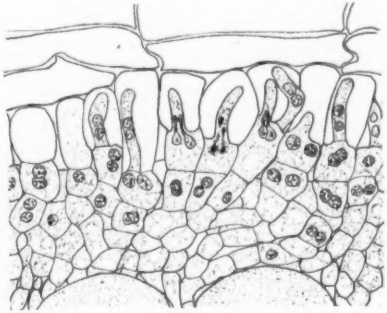
Figs. 9 and 10, *Gymnosporangium globosum*. The upper figure shows the conditions from the margin of a sorus inward. The lower figure is drawn



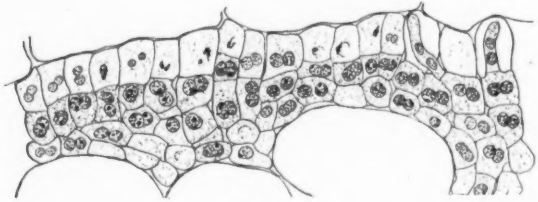
GYMNOSPORANGIUM MACROPUS



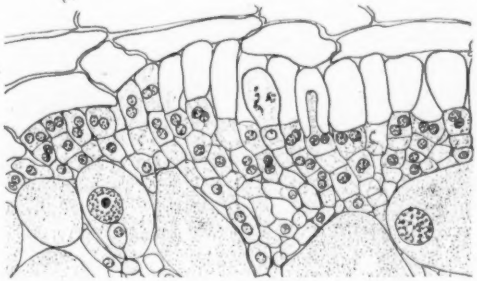
5



7

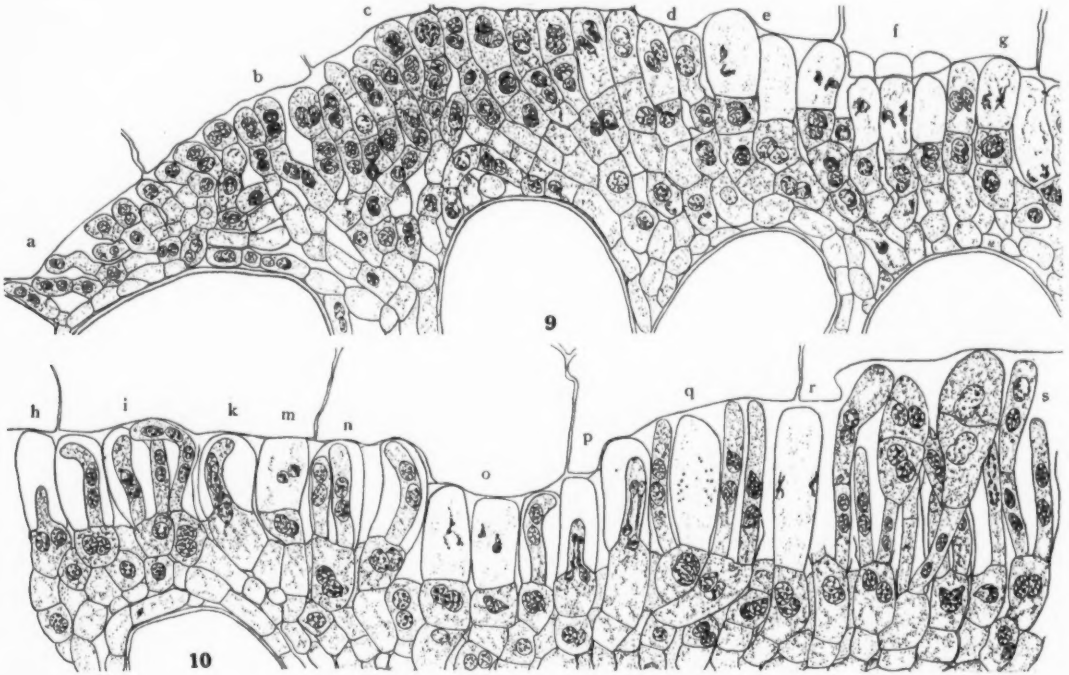


8



6

FIG. 5. G. GLOBOSUM. FIGS. 6, 7. G. CLAVARIAEFORME. FIG. 8. G. NIDUS-AVIS



GYMNOSPORANGIUM GLOBOSUM

from the same section but at about the center of the sorus. Between the two parts shown there is a space equivalent to about five or six times the amount shown in the figures. At *a* (Fig. 9) marginal growth is still continuing slowly. The nuclei in the terminal cell at *b* appear to be degenerating. The sorus is abnormally high at *c-d* due to an irregularity in the gall. Here the terminal cells have been cut off and their cytoplasm is becoming more vacuolated; *e*, first buffer cell that has lost both cytoplasm and nuclei; *f*, *g*, a depression in the primordium due to a less vigorous growth of the hyphal mass below; *m*, *o*, *q*, *r*, other terminal cells in various stages of degeneration; *h*, a basal cell just beginning to bud; *p*, conjugate division of the nuclei in young spore buds; *k*, nuclear division completed in a bud that pushes out laterally from the basal cell on its lower side, and the septum, if formed, is not visible because the bud bends down and is not within the terminal cell as it appears in the figure; *i*, *n*, *q*, *r*, two-nucleated buds cut off by septa from their basal cells; *s*, four-nucleated buds, nuclei of a two-nucleated bud dividing, two-celled spores, nuclear fusions, etc.

CULTURES WITH MELAMPSORAE ON POPULUS

JAMES R. WEIR AND ERNEST E. HUBERT

Additional cultural results with the *Melampsorae* on species of *Populus* have been secured since the positive results in 1916 on species of *Larix* with the rust known as *Melampsora medusae* Thüm. found on *Populus trichocarpa* and *P. tremuloides*.[1] The telial material on *P. tremuloides* used in 1916 was typical of *M. albertensis* Arth., but owing to the fact that positive results were secured on species of *Larix* only and negative results on *Pseudotsuga taxifolia*[2] is was referred to *M. medusae*.

In April, 1917, a large number of cultures were undertaken for the purpose of checking the two rusts commonly found on *Populus* in the Northwest. The aecial stage known as *M. albertensis* on *Pseudotsuga taxifolia* was found in July, 1916, at Darby, Montana, and at other points, but no successful check cultures had been made for this region up to the present report. The results of the 1917 cultures are presented in Table I. All cultures were made under control conditions in the greenhouse at Missoula, Montana, by the use of celluloid cylinders. An attempt was made to use only those hosts having young susceptible needles.

A study of the data in Table I shows that the sporidia of the rusts known as *M. albertensis* and *M. medusae* infect species of *Larix* and species of *Pseudotsuga* without any apparent preference on the part of either fungus for any particular host genus. Teliospores from a small portion of an infected leaf of collection No. 24 was used to inoculate both *Larix occidentalis* and *Pseudotsuga taxifolia* with positive results in both cases. This was done to eliminate so far as possible the chance of having two

[1] Weir, Jas. R., and Hubert, E. E. Recent cultures of forest tree rusts. Phytopath. 7: 106–109. 1917.

[2] The negative results on *Pseudotsuga taxifolia* in the light of recent work have since been attributed to the use of trial hosts with needles too far advanced in growth. It appears that the youngest and most tender needles are the most susceptible to infection.

species of *Melampsora* on leaves of the same host and included in one collection. In order to check the results obtained from sowing sporidia of *M. medusae* (collection No. 24) on *Pseudotsuga* species the aeciospores thus obtained were sown on young leaves of *Populus trichocarpa*. The leaves were inoculated May 18 and uredinia appeared June 8. Successful inoculations have been secured by sowing some of these urediniospores upon leaves of *Populus trichocarpa*. Inoculations were made on June 9, 1917, and on June 20 abundant uredinial sori were produced. This explains the great abundance of these rusts in regions of few aecial hosts. The proper conclusion of this culture will be to use the telial stage in producing the rust on *Larix*.

Aeciospores resulting from a successful inoculation with collection No. 57 on *Larix occidentalis* were sown June 29, 1917, on young leaves of *Populus trichocarpa*. Uredinia developed in abundance on July 7. No marked differences could be found between the uredinia and urediniospores of this culture and those resulting from an inoculation of *P. trichocarpa* leaves with aeciospores from *Pseudotsuga taxifolia*.

A careful study of the pycniospores and aeciospores resulting from the above cultures was made. These aeciospores on species of *Larix* and on species of *Pseudotsuga* were also compared with aeciospores on *Larix laricina* resulting from an inoculation with telia of *Melampsora medusae* from *Populus deltoides* and *P. tremuloides* cultured by Mains at Ann Arbor, Michigan, May 14, 1914 (N. A. U. No. *1121*). No important differences could be found in comparing the characteristics of these spores. Repeated attempts have been made to find evident differential characters by which the uredinia and telia of these two forms here considsidered may be plainly and readily separated, but with very little success. The first noticeable gross character of *M. albertensis* is that the telia appear to spread out like melted wax while those of *M. medusae* (Fig. 1) are more elevated and conspicuous. The former character of *M. albertensis* only holds good, however, where average-sized leaves of its most common host, viz., *Populus tremuloides* are infected. The rust has been repeatedly collected from large leaves from sprouts at the base of trees which

had all the gross characters of *M. medusae* although the average-sized leaves on the parent tree bore the typical form of the rust, *M. albertensis*. These same variations may be noted when the host is *P. trichocarpa*. In regions where the only possible aecial host is *Pseudotsuga taxifolia* the form *M. medusae* will exhibit the same gross variations on *P. trichocarpa* and *P. tremuloides*. It is equally difficult to try to separate the teliospores of these rusts microscopically. The fact that either of them will go on both *Pseudotsuga* and *Larix* irrespective of source or appearance of telia indicates that these rusts which were at first distinguished as *M. medusae* and *M. albertensis* are the different host manifestations of the same rust and should apparently be referred to *Melampsora medusae* Thüm.

Arthur in 1910[3] and in 1911[4] successfully inoculated *Pseudotsuga taxifolia* (*P. mucronata*) with the telial stage of *M. albertensis*, in every case securing negative results on *Larix* spp. As no statement is made regarding the age of the needles used in these inoculations we venture to suggest that the needles of the larches used may have been too old to become infected. This would undoubtedly be the case if the host trees used developed their needles at the same time that trees of similar spcies develop needles in the open. Observations in this locality show that the new needles of *Larix occidentalis* growing in the open were far enough advanced on May 8, 1917, to be susceptible to infection and on the same date the leaf buds of *Pseudotsuga taxifolia* were not even swelling. New susceptible needles of *Pseudotsuga* were not recorded in the open until May 28 and later June 8. On June 8 the aecial stage of the rust was found near Missoula, Montana, on *Larix occidentalis*, while adjacent trees of *Pseudotsuga taxifolia* were just forming new needles. The host trees, used in the inoculation experiments here recorded and kept in the greenhouse since the preceding two seasons, developed new needles at earlier dates than those recorded for similar trees in the open. In the majority of cases the newly-formed needles were the only ones on the trial host which became infected.

[3] Arthur, J. C. Cultures of Uredineae in 1910. Mycologia 4: 7–33. 1912.
[4] Arthur, J. C. Cultures of Uredineae in 1911. Mycologia 4: 49–65. 1912.

TABLE I

INOCULATION DATA FOR RUSTS ON POPULUS SPECIES

Collection No	Inoculating Material.—Telia.	Locality of Telial Collection.	Species Inoculated.	No. Plants Inoculated.	Date Inoculation 1917.	Pycnia.	Aecia.	Degree of Infection.
8073	*Melampsora medusae* on *Populus trichocarpa*	Missoula, Montana	*Larix europea*	1	May 3	May 17	May 21	Medium
8073	Ditto	Ditto	*Pseudotsuga taxifolia*	1	May 8	May 18	May 23	Heavy
20	*Melampsora albertensis* on *Populus tremuloides*	Spokane, Wash.	*Larix occidentalis*	2	April 16	Apr.l 26	May 2	Heavy
20	Ditto	Ditto	Ditto	1	April 30	May 14	May 21	Heavy
20	Ditto	Ditto	*Larix europea*	1	April 26	May 8	May 14	Heavy
20	Ditto	Ditto	*Pseudotsuga taxifolia*	1	April 17	May 7	May 31	Heavy
20	Ditto	Ditto	Ditto	1	April 19	May 7	May 14	Heavy
20	Ditto	Ditto	Ditto	1	April 23	May 7	May 13	Very heavy
20	Ditto	Ditto	*Pseudotsuga macrocarpa*	1	April 21	May 12	May 19	Heavy
20	Ditto	Ditto	*Larix lyallii*	2	April 16	April 27	May 8	Heavy
20	Ditto	Ditto	*Tsuga heterophylla*	1	April 19	0	0	Negative
24	*Melampsora medusae* on *Populus trichocarpa*	Ditto	*Larix occidentalis*	1	April 26	May 8	May 17	Medium
24	Ditto	Ditto	*Larix lyallii*	1	April 27	May 14	No aecia	Medium
24	Ditto	Ditto	*Pseudotsuga taxifolia*	1	April 26	May 7	May 14	Heavy
40	Ditto	Darby, Montana	Ditto	1	May 18	May 29	June 2	Heavy
43	Ditto	Ditto	*Larix occidentalis*	1	May 18	May 29	June 3	Heavy
43	Ditto	Ditto	*Pseudotsuga macrocarpa*	1	May 17	0	0	Negative. Needles too old
49	*Melampsora albertensis* on *Populus tremuloides*	Pattee Creek, Missoula, Montana	*Larix occidentalis*	2	May 20	May 29	June 2-3	Heavy
49	Ditto	Ditto	*Pseudotsuga macrocarpa* (old needles)	1	May 20	—	—	No result. Needles too old
57	*Melampsora medusae* on *Populus trichocarpa*	Grant Creek, Missoula	*Pseudotsuga taxifolia*	1	June 11	June 20	June 26	Heavy
57	Ditto	Ditto	*Larix occidentalis*	1	June 11	June 20	June 24	Heavy
58	Ditto	Boulder, Montana	*Pseudotsuga taxifolia*	1	June 14	June 24	June 29	Heavy
58	Ditto	Ditto	*Larix occidentalis*	1	June 14	0	0	No result. Needles too old
33	*Melampsora albertensis* on *Populus tremuloides*	Darby, Montana	*Pseudotsuga taxifolia*	1	May 8	May 21	May 27	Medium

An interesting feature of the pycnial stage of the *Melampsorae* is a pronounced and characteristic odor evident at the time the pycnia are expelling spores. Exudations of a clear liquid also accompany this stage and are found to be sweet to the taste. These characters are possessed by the pycnial stage of a number of other forest trees and field plant rusts. The odor of the pycnial stage of *Melampsorella elatina* (A. & S.) Arth. on *Abies* spp., *Peridermium coloradense* (Dietl.) A. & K. on *Picea engelmanni*, and *Puccinia monoica* (Pk.) Arth. on *Arabis kochii* is particularly noticeable. The pycnial odor of the *Melampsorae* is fragrant, while that of *Peridermium coloradense* is decidedly offensive, approaching the odor given out by certain Nymphaeas.

SUMMARY

The results of the present investigation show that the rusts on *Populus* which were heretofore distinguished as *Melampsora medusae* and *M. albertensis* will infect both *Pseudotsuga* and *Larix*. In the absence of sharp differential characters between these two forms, both in their gross and minute details, it is suggested that they are the different host manifestations of the same rust and should apparently be referred to *Melampsora medusae* Thüm.

Two new hosts for this rust are recorded, viz., *Larix lyalli* and *Pseudotsuga macrocarpa*.

New and interesting features attending the production of pycnia in the *Melampsorae* are reported.

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MISSOULA, MONTANA.

NORTH DAKOTA FUNGI[1]—II

J. F. Brenckle

III. Lower Basidiomycetes

Aecidium Allenii Clint.
On *Elaeagnus argentea*. Kulm and Leeds, June, 1912, Lunell.
(Fungi Dak. *126*.)

Aecidium Boltoniae Arth.
On *Boltonia asteroides*. Kulm, June, 1911.
(Fungi Dak. *127*.)

Aecidium Convallariae Schum.
On *Polygonatum giganteum*. Leeds, July, 1913, Lunell.

Aecidium Compositarum Authors.
On *Ratibida columnaris*. Logan Co., July, 1912.

Aecidium Falcatae Arth.
On *Falcata comosa*. Washburn, July, 1915, Stevens.
(Fungi Dak. *326*.)

Aecidium Grindeliae Griff.
On *Grindelia squarrosa*. Kulm, June, 1909.
(Fungi Dak. *201*.)

Aecidium magnatum Arth.
On *Vagnera stellata*. Kulm, June, 1908.
(Fungi Dak. *1*.)

Aecidium Lilii Clint.
On *Lilium umbellatum*. July, 1913.

Aecidium Liatridis Ellis & Ander.
On *Liatris punctata, L. scariosa*. Kulm, June, 1910.
(Fungi Dak. *101, 401*.)

Aecidium Malvastri Arth.
On *Malvastrum coccineum*. Kulm, June, 1911.

Aecidium Hydrophylli Peck.
On *Hydrophyllum virginicum*. Fargo, May, 1915, Stevens.
(Fungi Dak. *302*.)

Aecidium Ranunculacearum DC.
On *Anemone cylindrica, Ranunculus sceleratus*. Kulm, June, 1908.

Aecidium Sommerfelti Johanson.
On *Thalictrum purpurascens*. Fargo, June, 1908, Seaver.

Aecidium Thalictri Chev.
On *Thalictrum thyrsoideum, T. Lunellii, T. vegetum, T. dasycarpum*.
Leeds, Lunell, Fargo, Stevens; Kulm.
(Fungi Dak. *104*.)

[1] A few species are included from bordering counties in South Dakota.

Aecidium Violae Schum.

On *Viola sororia, V. papilionacea, V. scabriuscula, V. arenaria.* Fargo, 1915, Stevens; Leeds, Lunell and Kulm.

(Fungi Dak. *151.*)

Cintractia externa (Griff.) Clint.

On *Carex filifolia.* Kulm, June, 1909.

(Fungi Dak. *52.*)

Coleosporium Solidaginis (Schw.) Thuem.

On *Aster chinensis,* and *A. laevis.* Fargo, 1915, Stevens.

On *Aster paniculatus,* and *A. multiflorus.* Kulm, 1912.

On *Solidago canadensis, S. gilvocanescens,* and *S. Pitcheri.* Leeds, Lunell.

On *Solidago serotina, S. mollis.* Kulm, 1909.

(Fungi Dak. *77, 276, 276a, 305, 305a, 355, 355a.*)

Cronartium Comandrae Peck.

On *Comandra pallida.* Beaver Lake, Sentinel Butte, and Camp Crook, S. D.

(Fungi Dak. *78, 403.*)

Doassansia Alismatis (Nees) Cornu.

On *Alisma Plantago-aquatica.* Kulm, June, 1913.

(Fungi Dak. *202.*)

Doassansia Sagittariae (West.) Fish.

On *Sagittaria latifolia.* Kulm, July, 1914.

(Fungi Dak. *253.*)

Earlea speciosa (Fr.) Arth.

On *Rosa praticola, R. heliophylla,* and *R. blanda.* Kulm and Leeds.

(Fungi Dak. *53, 53a, 53b.*)

Entyloma Compositarum Farl.

On *Erigeron philadelphicum.* Valley City, 1884, Seymour.

Entyloma Menispermi Farl. & Trel.

On *Menispermum canadense.* Valley City, Seymour.

Entyloma Physalidis (Kalch. & Cooke) Wint.

On *Solanum triflorum.* Bismark, 1884, Seymour.

Gymnosporangium Betheli Kern.

On *Juniperus scopulorum.* Williston, 1915, Stevens.

On *Crataegus* sp. Williston.

(Fungi Dak. *331.*)

Gymnosporangium globosum Farl.

On *Juniperus prostrata.* Glen Ullin, July, Stevens.

(Fungi Dak. *332.* Not *332a.*)

Gymnosporangium Juniperi-virginianae Schw.

On *Malus ioensis,* and *Juniperus virginiana.* Fargo, 1915, Stevens.

(Fungi Dak. *358.*)

Gymnosporangium juvenescens Kern.

On *Amelanchier alnifolia,* and *Juniperus prostrata.* Williston, Glen Ullin, Sentinel Butte, 1915, Stevens.

(Fungi Dak. *278, 359, 359a.*)

Gymnosporangium Nelsoni Arth.

On *Juniperus scopulorum.* Williston, 1915, Stevens.

(Fungi Dak. *332a.* Not *G. globosum* Farl.)

Melampsora Bigelowii Thüm.

On *Salix amygdaloides, S. candida,* and *S. longifolia.* Kulm, Leeds, and Fargo.

(Fungi Dak. *37, 176.*)

Melampsora Lini Desm.

On *Linum Lewisii.* Dore, Stevens.

On *Linum rigidum.* Dickenson.

On *Linum sulcatum,* and *L. usitatissimum.* Kulm.

(Fungi Dak. *235, 235a.*)

Melampsora Medusae Thüm.

On *Populus deltoides, P. tremuloides.* Kulm, 1909.

On *P. monilifera.*

(Fungi Dak. *79.*)

Nigredo appendiculatus (Pers.) Arth.

On *Phaseolus nanus.* Kulm, Sept., 1909.

(Fungi Dak. *87. Uromyces appendiculatus* (Pers.) Ung.)

Nigredo Eleocharidis Arth.

On *Eleocharis olivacea,* and *E. palustris.* Kulm, 1908.

(Fungi Dak. *50,* as *Uromyces Eleocharidis* Arth.)

Nigredo Fabae (Pers.) Arth.

On *Lathyrus venosus.* Fargo, Ft. Ransom, 1915, Stevens.

(Fungi Dak. *372.*)

Nigredo intricata (Cooke) Arth.

On *Eriogonum flavum, E. multiceps.* Sentinel Butte, Aug., 1916; Medora, 1884, Seymour.

(Fungi Dak. *406.*)

Nigredo Junci (Desm.) Arth.

On *Juncus balticus.* Kulm, Dec., 1910.

On *Ambrosia psilostachya, Circium Flodmanii, Helianthus Maximilliani,* and *H. tuberosus.* Kulm and Fargo.

(Fungi Dak. *20, 52 Aecidium Cardui* Arth., *26 Aecidium Compositarum* Mart., *45a. Puccinia Helianthus* Schw. *1, 350.*)

Nigredo perigynia (Halst.) Arth.

On *Carex abbreviata.* Leeds, June, 1912, Lunell.

Nigredo plumbaria (Peck) Arth.

On *Gaura coccinea.* Kulm, June, 1916.

Nigredo Polemonii (Peck) Arth.

On *Spartina Michauxiana.* Kulm, 1909.

On *Collomia linearis,* and *Steironema Lunellii.* Kulm, June, 1910.

On *Dodecantheon thornense.* June, 1914, Thorne, Lunell.

On *Vagnera stellata* (?). Kulm, 1911.

(Fungi Dak. *70, 102, 134, 259,* and probably *1.*)

Nigredo Polygoni (Pers.) Arth.

On *Polygonum aviculare, P. erectum.* Kulm, Oct., 1909.

(Fungi Dak. *72, 133, 133a.*)

Nigredo proeminens (DC.) Arth.

On *Euphorbia glyptosperma, E. stricticaulis,* and *E. serpyllifolia.* Kulm and Leeds, 1910, Lunell.

(Fungi Dak. *71, 71a, 119, 155, 177.*)

Nigredo punctata (Schroet.) Arth.
On *Astragalus adsurgens, Aragallus Lambertii, Homolobus caespitosus,* and *Orophaca caespitosa.* Kulm, Garrison, Sentinel Butte.
(Fungi Dak. *178, 373, 389.*)

Nigredo Scirpi (Cast.) Arth.
Scirpus fluviatilis, S. campestris, Sium cicutaefolium. Kulm, 1909.
(Fungi Dak. *120, 120a, 179, 374.*)

Nigredo Silphii (Burrill) Arth.
On *Juncus tenuis.* Kulm, 1908.
(Fungi Dak. *21.*)

Nigredo Trifolii (Hew.) Arth.
On *Trifolium pratense,* and *T. repens.* Kulm, Fargo, 1914, Stevens.
(Fungi Dak. *74, 283, 375.*)

Phragmidium americanum Arth.
On *Rosa blanda.* Kulm, July, 1908.
(Fungi Dak. *7.*)

Phragmidium Andersoni Shear.
On *Dasiphora fruticosa tenuifolia.* Sentinel Butte, Aug., 1916.
(Fungi Dak. *408.*)

Phragmidium imitans Arth.
On *Rubus strigosus.* Delaney's Ranch, Aug., 1915.
(Fungi Dak. *360.*)

Phragmidium montivagum Arth.
On *Rosa* sp. Sentinel Butte, Aug., 1916.
(Fungi Dak. *203.*)

Phragmidium Potentillae (Pers.) Karst.
On *Potentilla bipinnatifida, P. pennsylvanica.* Leeds, 1912, Lunell.
On *Potentilla pennsylvanica strigosa.* Kulm, 1907.
(Fungi Dak. *6, 180, 180a.*)

Phragmidium Rosae-acicularis Liro.
On *Rosa heliophylla.* Kulm, July, 1912.
(Fungi Dak. *181.*)

Phragmidium Rosae-arkansanae Dietel.
(Fungi Dak. *152, 182, 285, 362.*)

Pileolaris Toxicodendri (Berk. & Rav.) Arth.
On *Rhus radicans.* Kulm, June, 1908.
(Fungi Dak. *22.*)

Polythelis Pulsatillae (Rost.) Arth.
On *Pulsatilla hirsutissima.* Kulm, June, 1908.
(Fungi Dak. *129.*)

Polythelis Thalictri (Chev.) Arth.
On *Thalictrum dasycarpum.* Fargo, 1915, Stevens.
(Fungi Dak. *317.*)

Puccinia ambigua (Albert. & Schw.) Lagh.
On *Galium Aparine.* Beaver Lake, July, 1909.
(Fungi Dak. *59.*)

Puccinia amphigena Diet.
On *Calamovilfa longifolia.* Kulm, Oct., 1910.

On *Smilax herbacea*. Kulm.
(Fungi Dak. *80*.)

Puccinia amphibii Fuckel.
On *Polygonum emersum*. Kulm, Aug., 1908.
(Fungi Dak. *41*.)

Puccinia Andropogonis Schw.
On *Andropogon furcatus*, *A. Hallii*, and *A. scoparius*. Kulm and other places, also 1884, Seymour.
(Fungi Dak. *42*, *315*.)

Puccinia Anemones-virginianae Schw.
On *Anemone virginiana*. Wild Rice, Aug., 1914, Stevens.
(Fungi Dak. *289*.)

Puccinia angustata Peck.
On *Scirpus atrovirens*. Kulm, Oct., 1909.
On *Lycopus americanus*.
(Fungi Dak. *105*, *105a*.)

Puccinia apocrypta Ellis & Tracey.
On *Elymus canadensis*. Kulm, July, 1911.
(Fungi Dak. *128*.)

Puccinia Asparagi DC.
On *Asparagus officinalis*. Leeds, Sept., 1914, Lunell.
(Fungi Dak. *261*.)

Puccinia Asteris Duby.
On *Aster longifolius*, *A. multiflorus*, *A. Novae-Angliae*, and *A. paniculatus*. Kulm, Aug., 1908; Leeds, Sept., 1914, Lunell.
(Fungi Dak. *60*, *290*.)

Puccinia atropuncta Peck & Clint.
On *Zygadenus elegans*. Kulm, Aug., 1909.

Puccinia Bartholomaei Diet.
On *Bouteloua oligostachya*. Kulm, Oct., 1913.
(Fungi Dak. *183*.)

Puccinia Caricis-asteris Arth.
On *Aster longifolius*, *A. multiflorus*. Kulm, Aug., 1909.

Puccinia cinerea Arth.
On *Puccinellia airoides* and *Oxygraphis Cymbalaria*. Kulm, June and Sept., 1912.
(Fungi Dak. *185*, *185a*.)

Puccinia Cirsii Lasch.
On *Cirsium Flodmannii*. Kulm, Aug., 1909.
(Fungi Dak. *64*.)

Puccinia Convolvuli Cast.
On *Calystegia sepium*. Fargo, Valley City, 1884, Seymour.

Puccinia Coronata Corda.
On *Avena sativa*, *Calamagrostis hyperborea*, and *Scolochloa festucacea*. Kulm, Oct., 1911, also 1884, Seymour.
(Fungi Dak. *340*, *340a*, *414*, *113*.)

Puccinia Crandellii Pam. & Hume.
On *Festuca ovina*, *Symphoricarpos occidentalis*. Kulm, June, 1909.
(Fungi Dak. *81*, *76 Aecidium abundans* Peck.)

Puccinia DeBaryana Thüm.

On *Pulsatilla hirsutissima*. Kulm, June, 1908.

(Fungi Dak. *61*.)

Puccinia distichlis Ellis & Everh.

On *Spartina Michauxiana*, and *S. gracilis*. Kulm.

On *Steironema ciliatum*. Kulm, Oct., 1908, and Fargo, May, 1915, Stevens.

(Fungi Dak. *108*, *316*.)

Puccinia Eatoniae Arth.

On *Sphenopholis obtusata*, and *S. pallens*. Beaver Lake, July, 1909.

On *Ranunculus abortivus*. Fargo, May, 1915. Stevens.

(Fungi Dak. *184*.)

Puccinia Ellisiana Thüm.

On *Andropogon scoparius*. Kulm, Aug., 1909.

On *Viola papilionacea*, and *V. Lunellii*. Kulm, May, 1912.

(Fungi Dak. *40*, *151 Aecidium Violae* Schum.)

Puccinia Epilobii DC.

On *Epilobium paniculatum*. Wild Rice, Aug., 1915, Stevens.

Puccinia extensicola Plowr.

On *Carex cephaloidea*, *C. festucacea*, *C. viridula*, *C. vulpinoidea* and other spp. of *Carex*. Kulm, Fargo, Washburn, Bismark, Stevens.

On *Aster multiflorus*, *A. paniculatus*, *Solidago canadensis*, *S. serotina*, and *S. missouriensis*. Kulm, Fargo.

(Fungi Dak. *341*, *341a*, *364*, *364a*, *103 Aecidium solidaginicolum*.)

Puccinia flosculosarum (Albert. & Schw.) Roehl.

On *Cnicus*. Fargo, 1884, Seymour.

Puccinia fraxinata (Schw.) Arth.

Spartina Michauxiana, *S. gracilis*, and *Fraxinus lanceolata*. Kulm, Sept., 1909, and June, 1908.

(Fungi Dak. *15*, *2 Aecidium Fraxini* Schw.)

Puccinia Gentiani (Str.) Link.

On *Gentiana affinis*. Leeds, Sept., 1916, Lunell.

On *Gentiana puberula*. Kulm, Sept., 1913, also 1884, Seymour.

(Fungi Dak. *415*.)

Puccinia gigantispora Bubak.

On *Anemone cylindrica*. Kulm, July, 1908.

Puccinia graminis Pers.

On *Agropyron pseudorepens*, *A. tenerum*, *A. occidentalis*, *A. Richardsonii*, *Avena fatua*, *A. sativa*, *Beckmannia erucaeformis*, *Elymus canadensis*, *Hordeum jubatum*, *H. vulgare*, *Koeleria cristata*, *Triticum sativum*, and *T. Spelt*. Kulm, Aug., 1910.

(Fungi Dak. *13*, *43*, *44*, *44a*, *44b*, *44c*.)

Puccinia Grindeliae Peck.

On *Gutierrezia Sarothrae*. Beaver Lake, July, 1908.

Puccinia Grossulariae (Schum.) Lagerh.

On *Carex laxiflora*. Fargo, Sept., 1915, Stevens.

On *Ribes floridum*, *R. americanum*, and *R. Uva-crispa*. Kulm, Leeds, and Lunell.

(Fungi Dak. *365*, *201* as *Aecidium Grossulariae* DC.)

Puccinia Helianthi Schw.

On *Helianthus annuus, H. Maximiliani, H. nitidus, H. subrhomboideus, H. tuberosus.* Kulm, Fargo, Leeds, Beaver Lake, also 1884, Seymour.

(Fungi Dak. *45, 45a, 153, 153a, 366.*)

Puccinia hemisphaerica (Peck) Ellis & Everh.

On *Lactuca pulchella.* Kulm, July, 1909.

(Fungi Dak. *62, 62a.*)

Puccinia Heucherae (Schw.) Diet.

On *Heuchera hispida.* Kulm, June, 1909.

(Fungi Dak. *63.*)

Puccinia Hieracii (Schw.) Mart.

On *Hieracium umbellatum.* Turtle Mts., Aug., 1907, Lunell.

Puccinia Impatientis (Schw.) Arth.

On *Impatiens biflora.* Fargo, July, 1915, Stevens.

Puccinia Koeleriae Arth.

On *Koeleria cristata.* Kulm, Aug., 1909.

(Fungi Dak. *82.*)

Puccinia Kuhniae Schw.

On *Kuhnia eupatorioides.* Bismark, Valley City, 1884, Seymour.

Puccinia ludibunda Ellis & Everh.

On *Carex Bebbii.* Beaver Lake, Aug., 1912.

(Fungi Dak. *186.*)

Puccinia Menthae Pers. var. *americana* Peck.

On *Mentha canadensis,* and *Monarda fistulosa.* Kulm, Mandan, Bismark, also 1884, Seymour.

(Fungi Dak. *14, 342.*)

Puccinia montanensis Ellis.

On *Agropyron tenerum, A. occidentale, Elymus canadensis, Onosmodium molle, Lithospermum angustifolium,* and *Thalictrum dasycarpum.* Kulm, Fargo, Leeds.

(Fungi Dak. *343, 104, Aecidium Thalictri, 343, 367, 367a.*)

Puccinia Muhlenbergiae Arth. & Holw.

On *Muhlenbergia racemosa.* Kulm, March, 1910.

(Fungi Dak. *110.*)

Puccinia Opizii Bubak.

On *Carex camporum, C. saccata, Lactuca pulchella, L. Scariola,* and *Nabalus racemosus.* Kulm, June, 1909, Aug., 1909, Leeds, Oct., 1916, Lunell.

(Fungi Dak. *111, 111a, 417.*)

Puccinia ornata Arth. & Holw.

On *Rumex occidentalis.* Towner, July, 1913, Lunell.

Puccinia Peckii Arth.

On *Carex Hookeriana.* Pleasant Lake, July, 1912, Lunell.

On *Carex lanuginosa, Oenothera strigosa,* and *Meriolix serrulata.* Kulm, June, and Aug., 1909.

(Fungi Dak. *65, 65a, 112.*)

Puccinia Poarum Neils.

On *Poa pratensis.* Fargo, Oct., 1914, Stevens.

(Fungi Dak. *291.*)

Puccinia Pruni-spinosae Pers.
On *Prunus americana*. Valley City, 1884, Seymour.
Puccinia pustulata Arth.
On *Andropogon furcatus, A. Hallii,* and *Comandra pallida*. Kulm, June, 1909.
(Fungi Dak. *83, 83a, 368.*)
Puccinia quadriporula Arth.
On *Carex Heydeni*. Kulm, July, 1908.
(Fungi Dak. *243.*)
Puccinia Rubella (Pers.) Arth.
On *Phragmites communis*. Leeds, Sept., 1912, Lunell.
On *Rumex salicifolia*. Fargo, June, 1915.
(Fungi Dak. *187.*)
Puccinia rubefaciens Johans.
On *Galium boreale*. Kulm, Aug., 1908.
On *G. linearifolium*. Leeds, Lunell, also 1884, Seymour.
(Fungi Dak. *16, 244.*)
Puccinia Rubigo-vera (DC.) Wint.
On *Hordeum jubatum*. Kulm, Oct., 1909.
(Fungi Dak. *154.*)
Puccinia Seymouriana Arth.
On *Asclepias speciosa*. Bismark, Aug. *22*, 1915.
Puccinia similima Arth.
On *Anemone canadensis*. Kulm, June, 1909.
On *Phragmitis communis*. Kulm, Nov., 1914.
(Fungi Dak. *115, 292.*)
Puccinia Sherardiana Koern.
On *Malvastrum coccineum*. Kulm, June, 1910.
(Fungi Dak. *66.*)
Puccinia Silphii Schw.
On *Silphium perfoliatum*. Fargo, July, 1914, Stevens and Seaver.
(Fungi Dak. *262.*)
Puccinia Sorghi Schw.
On *Zea Mays*. Kulm, Sept., 1908.
On *Oxalis stricta*. Kulm.
(Fungi Dak. *114, 114a.*)
Puccinia Sporoboli Arth.
On *Sporobolus heterolepis*. Kulm, Aug., 1915.
(Fungi Dak. *344.*)
Puccinia Stipae Arth.
On *Stipa spartea, Solidago missouriensis,* and *S. mollis*. Kulm, June and Aug., 1910, also 1884, Seymour.
(Fungi Dak. *67, 188.*)
Puccinia subnitens Diet.
On *Distichlis maritima,* and *Atriplex hastata*. Kulm, Aug., 1908.
(Fungi Dak. *47, 130.*)
Puccinia substerilis Ellis & Everh.
On *Stipa viridula*. Kulm, Jan., 1908.
(Fungi Dak. *84.*)

Puccinia Tanaceti DC.
On *Artemisia cana, A. frigida, A. longifolia,* and *A. ludoviciana.* Kulm, Sentinal Butte, and Leeds, also 1884, Seymour.
(Fungi Dak. *318, 418.*)
Puccinia Taraxaci (Recent.) Plowr.
On *Taraxacum officinale.* Kulm, Aug., 1908.
(Fungi Dak. *69.*)
Puccinia tosta Arth.
On *Sporobolus cuspidatus,* and *S. asperifolius.* Kulm, Oct., 1909.
(Fungi Dak. *46, 116.*)
Puccinia tomipara Trelease.
On *Bromus purgans.* Voltaire, Fred Schmidt, Jr.
Puccinia triticina Ericks.
On *Triticum vulgare.* Kulm, Aug., 1914.
(Fungi Dak. *345.*)
Puccinia universalis Arth.
On *Carex pennsylvanica, C. stenophylla,* and *C.* sp. Kulm, June, 1908.
On *Artemisia biennis, A. frigida, A. longifolia,* and *A. ludoviciana.* Kulm.
On *Hieracium umbellatum.* Fargo, June, 1915, Stevens.
(Fungi Dak. *106, 242, 189, 117, 131, 346.*)
Puccinia Urticae (Schw.) Lagerh.
On *Carex stricta, C. atherodes,* and *Urtica gracilis.* Kulm and Fargo.
(Fungi Dak. *12, 118, 294.*)
Puccinia Vernoniae Schw.
On *Vernonia fasciculata.* Kulm, Aug., 1915.
(Fungi Dak. *369.*)
Puccinia vexans Farl.
On *Atheropogon curtipendulus.* Kulm, March, 1908.
(Fungi Dak. *17.*)
Puccinia Violae (Schum.) DC.
On *Viola canadensis, V. papilionacea, V. arenaria.* Kulm, Sept., 1909.
(Fungi Dak. *245, 370, 419.*)
Puccinia Vulpinoidis Arth.
On *Carex vulpinoidea.* Kulm, Aug., 1908.
Puccinia Xanthii Schw.
On *Xanthium canadense.* Medora, 1884, Seymour.
Pucciniastrum Agrimoniae (Schw.) Tranz.
On *Agrimonia hirsuta.* Kulm, Aug., 1909.
(Fungi Dak. *85.*)
Pucciniastrum arcticum-americanum Farl.
On *Rubus strigosus.* Fargo, Oct., 1914.
(Fungi Dak. *293.*)
Pucciniastrum pustulatum (Pers.) Diet.
On *Chamaenerion angustifolium.* Sentinel Butte, Aug., 1916.
On *Epilobium adenocaulon.* Minot, Aug., 1915, Stevens.
(Fungi Dak. *371, 420.*)
Schizonella melanogramma (DC.) Schröt.
On *Carex pennsylvanica.* Kulm, July, 1913.
(Fungi Dak. *246.*)

Sphacelotheca montaniensis (Ellis & Everh.) Clint.
On *Muhlenbergia glomerata*. Beaver Lake, July, 1909.
(Fungi Dak. *190*.)
Sphacelotheca occidentalis (Seym.) Clint.
On *Andropogon Hallii*. Anselm, Aug., 1916.
(Fungi Dak. *421*.)
Sorosporium Ellisii Wint. var. *occidentalis* Seymour.
On *Andropogon furcatus*. Bismark, Sept., 1884, Seymour.
Sorosporium Syntherismae (Peck) Farl.
On *Cenchrus tribuloides*. Powers' ranch, Aug., 1916, Stevens.
Tilletia Earlei Griff.
On *Agropyron repens*. Leeds, Oct., 1916, Lunell.
Tilletia Tritici (Bjerk.) Wint.
On *Triticum vulgare* and *T. Spelta*. Kulm, Aug., 1909.
(Fungi Dak. *132, 132a*.)
Urocystis Anemones (Pers.) Schroet.
On *Pulsatilla hirsutissima*. Kulm, June, 1908.
(Fungi Dak. *18*.)
Uromyces astragalicola P. Henn.
On *Astragalus adsurgens*. Sentinel Butte, Aug., 1916.
(Fungi Dak. *425*.)
Uromyces dictyosperma Ellis & Everh.
On *Tithymalus missouriensis*. Fargo, July, 1914.
Uromyces Glycyrrhizae (Rabh.) Magnus.
On *Glycyrrhiza lepidota*. Kulm, June, 1908.
(Fungi Dak. *19*.)
Uromyces Rudbeckiae Arth. & Holw.
On *Rudbeckia laciniata*. Fargo, July, 1914.
(Fungi Dak. *274*.)
Uromycopsis porosa (Peck) Arth.
On *Vicia americana, V. linearis*, and *Psoralea argophylla*. Kulm, June, and Aug., 1909.
(Fungi Dak. *73, Uromyces Psoraleae* (Pers.) Fuckel, *191, 191a, 205, 3*.)
Uropyxis Amorphae Schroet.
On *Amorpha canescens, A. fruticosa*, and *A. nana*. Kulm, and Beaver Lake, also 1884, Seymour.
(Fungi Dak. *88, 192, 192a, 248*.)
Uropyxis Petalostemonis Farl.
On *Kuhnistera candida*. Kulm, June, 1909, also 1884, Seymour.
(Fungi Dak. *89*.)
Ustilago Avena var. *levis* Kellerm. & Swing.
On *Avena sativa*. Kulm, July, 1908.
(Fungi Dak. *90*.)
Ustilago foetens (Berk. & Curt.) Tul.
On *Triticum vulgare*. Kulm, Sept., 1908.
Ustilago Hieronymi Schroet.
On *Atheropogon curtipendulus*. Beaver Lake, July, 1909.
(Fungi Dak. *75*.)

Ustilago Hordei (Pers.) Kellerm. & Swing.
On *Hordeum vulgare*. Kulm, Aug., 1908.
(Fungi Dak. *23*.)
Ustilago hypodytes (Schl.) Fr.
On *Stipa spartea*. Beaver Lake, July, 1909.
Ustilago levis (Kellerm. & Swing.) Magn.
On *Avena sativa*. Kulm, July, 1909.
(Fungi Dak. —.)
Ustilago Lorentziana Thüm.
On *Hordeum jubatum*. Kulm, July, 1908.
(Fungi Dak. *24*.)
Ustilago longissima (Sow.) Tul.
On *Panicularia americana*. Kulm, Aug., 1909.
(Fungi Dak. *135*.)
Ustilago Maydis (DC.) Corda.
On *Zea Mays*. Kulm, Aug., 1908.
(Fungi Dak. *156*.)
Ustilago neglecta Niessl.
On *Chaetochloa glauca*. Fargo, 1907, Seaver.
(Fungi Dak. *275*.)
Ustilago nuda Kellerm. & Swing.
On *Hordem vulgare*. Kulm, July, 1908.
(Fungi Dak. *25*.)
Ustilago Panici-miliacei (Pers.) Wint.
On *Panicum miliaceum*. Kulm, Aug., 1909.
(Fungi Dak. *91*.)
Ustilago Tritici (Pers.) Jens.
On *Triticum vulgare*. Kulm, July, 1907.
(Fungi Dak. *167*.)
Ustilago subinclusa Körn.
On *Carex trichocarpa* var. *Deweyi*. Bismark, Sept., 1884, Seymour.

IV. HIGHER BASIDIOMYCETES

Agaricus campestris Linn.
On pastures and prairies. July, 1910.
Agaricus campestris L. var. *praticola*. (A large fleshy variety.)
On manure. Kulm, June, 1910.
Bovista pila Berk.
In pasture under trees. Kulm, June, 1913.
(Fungi Dak. *304*.)
Bovista plumbea Pers.
Barnyards and pastures. Kulm, fall, 1909.
(Fungi Dak. *92*.)
Bovistella echinella Pat.
On moss sod. Anselm, Aug., 1916.
(Fungi Dak. *376*.)
Bovistella dealbata (Sacc.) Lloyd.
On lawn. Kulm, July, 1908.

Calvatia caelata Bull.
On open prairie. Dickenson, L. R. Waldron, also Kulm.
(Fungi Dak. *171.*)
Calvatia lilacina var. *occidentalis* Lloyd.
On open prairie. Kulm, July, 1908.
(Fungi Dak. *172.*)
Catastoma circumscissum Berk. & Curt.
On pastures. Kulm, Sept., 1908.
(Fungi Dak. *29.*)
Catastoma nigrescens Lloyd.
On old manured ground. Kulm, fall, 1908.
(Fungi Dak. *207.*)
Catastoma subterraneum Lloyd.
Waste places. Dickenson, L. R. Waldron.
Clitocybe dealbata Sow.
On pastures. Kulm, Aug., 1911.
Clitocybe infundibuliformis Schaeff.
Soil in woods. Anselm, Aug., 1916.
Coprinus atramentarius (Bull.) Fr.
Around cotton-wood stumps. Kulm, July, 1914.
Coprinus comatus Fr.
On newly turned soil. Kulm, Oct., 1911.
Coprinus ephemerus Fr.
On fresh manure. Kulm, May, 1908.
Coprinus micaceus Fr.
Waste places on soil. Kulm, May, 1908.
Coprinus fimetaris Fr.
On new manure. Kulm, May, 1910.
Cortinarius ochroleucus Fr.
On soil under trees. Kulm, July, 1914.
Corticium byssinum (Karst.) Burt.
On *Symphoricarpos occidentalis.* Kulm, July, 1916.
Corticium cremicolor Berk. & Curt.
On *Corylus americana.* Fargo, Nov., 1916, Stevens.
Corticium laetum Karst.
On *Symphoricarpos occidentalis.* Kulm, Nov., 1916.
Corticium vellereum Ellis & Cragin.
On *Populus tremuloides.* Camp Crook, S. Dak., July, 1912, Weir.
Crucibulum vulgare Tul.
On leaves and twigs, in woods. Anselm, Aug., 1916.
Cyathus Schweinitzii Tul.
On twigs. Kulm, Apr., 1908. Fargo, woods, July, 1914. Valley City, June, 1906, Perrine.
Cyathus stercoreus Schw.
On manure and soil. Kulm, Sept., 1908.
Cyathus vernicosus DC.
Valley City, June, 1906, Perrine.

Daedalea confragosa (Bolt.) Pers.
On *Salix*. Kulm, Fargo, and Ft. Ransom.
(Fungi Dak. *356*.)
Daedalea unicolor Bull.
On wood. Fargo, July, 1914.
Fomes applanatus Pers.
On *Populus deltoides*. Kulm and Ft. Ransom, 1916. Camp Crook, S. D., Weir.
Fomes conchatus Pers.
On *Salix longifolia*. Kulm, Oct., 1916.
Fomes Ellisianus Anders.
On *Shepherdia argentea*. Camp Crook, S. D., 1912, Weir, Dickenson, Sept. 1, 1916.
(Fungi Dak. *380*.)
Fomes fomentarius Gill.
On birch cordwood (shipped in). Kulm, 1909.
Fomes fraxinophilus Peck.
On *Fraxinus lanceolata*, and (*Quercus macrocarpa ?*). Fargo, 1914, and Ft. Ransom, 1916. Camp Crook, S. D., 1912, Weir.
(Fungi Dak. *381*.)
Fomes igniarius (L.) Gill.
On *Ostrya virginiana* and *Populus tremuloides*. Fargo, 1914, 1916, Stevens. Camp Crook, S. Dak., 1912, Weir.
Fomes Laricis Rubel.
On *Pinus ponderosa*. Camp Crook, S. D., 1912, Weir.
Fomes ohiensis Berk.
On *Quercus macrocarpa*. Fargo woods, June, 1914.
Fomes Pini (Brot.) Lloyd.
On *Pinus ponderosa*. Camp Crook, S. D., 1912, Weir.
Fomes pinicola Swartz.
On *Pinus ponderosa*. Camp Crook, S. D., 1912, Weir.
Fomes pomaceus Pers.
On *Prunus americana* and *P. melanocarpa*. Fargo, Ft. Ransom and Sentinal Butte, N. D., also Camp Crook, S. D., Weir.
(Fungi Dak. *382*.)
Fomes Ribis (Schum.) Gill.
On *Symphoricarpos occidentalis* in the fall. Kulm and Bismark, 1910.
(Fungi Dak. *404*.)
Fomes scutellatus Schw.
On *Acer negundo*. Ft. Ransom, Aug., 1916.
Galera crispa Longyear.
On lawns. Kulm, July, 1914.
Galera lateritia Fr.
On lawns. Kulm, Aug., 1915.
Galera tener (Schaeff.) Quél.
On lawns. Kulm, July, 1912.
Geaster asper Michel.
Waste places on soil. Kulm, 1908. Leeds, 1910, Lunell.
(Fungi Dak. *35*.)

Geaster floriformis Vitt.
On prairie. Kulm, 1906.
(Fungi Dak. *36.*)
Geaster mammosus Chev.
On soil in woods. Fargo, 1905, L. R. Waldron.
(Fungi Dak. *254.*)
Geaster saccatus Fr.
On soil in woods. Anselm, Aug., 1916.
Hebeloma glutinosum Linn.
On old straw. Kulm, Sept., 1911.
Hymenochaete cinnamomea Pers.
On *Corylus americana.* Fargo, Nov., 1916, Stevens.
Hymenochaete Curtisii Berk.
On *Quercus macrocarpa.* Ft. Ransom, Aug., 1916.
Hymenochaete tabacina (Sow.) Lev.
On *Amelanchier alnifolia.* Camp Crook, S. D., July, 1912, Weir.
Irpex lacteus Fr.
On *Fraxinus lanceolata, Populus deltoides, Prunus americana, Symphoricarpos occidentalis,* and *Vitis vulpinus.* Kulm, Fargo, and Ft. Ransom.
(Fungi Dak. *122.*)
Lentinus squamosus Schaef.
On R. R. ties. Kulm, May, 1910.
Lenzites betulina (L.) Fr.
On birch. Walhalla, Waldron.
Lenzites saepiaria Fr.
On R. R. ties. Kulm.
On *Pinus ponderosa.* Camp Crook, S. D., Weir.
(Fungi Dak. *405.*)
Lenzites vialis Peck.
On pine board. Kulm, July, 1914.
Lepiota granulosa Batsch.
On wood, under trees. Kulm, July, 1914.
Lepiota naucina Fr.
On lawn. Kulm, Sept., 1911, and Dacotah, Brenckle.
Lepiota procera Scop.
In meadow. Kulm, June, 1908.
Lycoperdon cepaeforme Morg.
On prairie. Kulm, and Dickenson, 1906, Waldron.
(Fungi Dak. *93.*)
Lycoperdon cruciatum Roth.
On prairie. Dickenson, 1906, Waldron.
Lycoperdon dakotensis Brenckle & Lloyd.
On prairie. Kulm, 1908.
(Fungi Dak. *94.*)
Lycoperdon gemmatum Batsch.
On soil in woods. Ft. Ransom, Aug., 1916, Stevens.
Lycoperdon rimulatum Peck.
On sand hills. Anselm, Aug., 1916.

Lycoperdon umbrinum Pers.
On decaying wood. Ft. Ransom, Aug., 1916, Stevens.
Lycoperdon Wrightii Berk. & Curt.
On prairie. Kulm, June, 1907.
(Fungi Dak. *95.*)
Marasmius caricicola Kauffm.
On *Carex* culms and leaves. Kulm, Sept., 1914.
Marasmius oreades Fr.
In meadow. Kulm, July, 1912.
Marasmius rotula Fr.
On old *Acer negundo.* Kulm, Aug., 1911.
(Fungi Dak. *173.*)
Marasmius siccus Schw.
On twigs and wood. Anselm, Aug., 1916.
Mycenastrum corium Desv.
On old manure. Kulm, Aug., 1908. Fargo, Stevens.
(Fungi Dak. *170.*)
Naucoria pediades Fr.
In meadow. Kulm, June, 1914.
Omphalia pyxidata Bull.
On moss sod. Kulm, Aug., 1911.
Panaeolus solidipes Peck.
On manure. Kulm, June, 1909.
Panaeolus fimicola Fr.
On cow dung. Kulm, Aug., 1911.
Panaeolus retirugis Fr.
On old straw. Kulm, July, 1911.
Peniphora Allescheri Bres.
On *Populus angustifolia.* Camp Crook, S. D., Weir.
Peniphora cinerea Cooke.
On *Symphoricarpos occidentalis.* Kulm, Nov., 1916.
Peniphora crassa Burt.
On *Pinus ponderosa.* Camp Crook, S. D., 1912, Weir.
Phlebia reflexa Berk.
On *Populus tremuloides.* Anselm, Aug., 1916.
Pholiota adiposa Fr.
On lawn. Kulm, Aug., 1914.
Pholiota praecox Pers.
On prairie. Kulm, May, 1908.
Pholiota praecox Pers. var. *minor* Batt.
On low meadow. Kulm, May, 1910.
Pleurotus ostreatus Jacq.
On *Populus deltoides.* Kulm, Aug., 1911.
Polyporus adustus Willd.
On *Acer Negundo,* and *Populus deltoides.* Kulm, 1911.
On *Populus angustifolia.* Camp Crook, S. D., 1912, Weir.
Polyporus amorphus Fr.
On *Pinus ponderosa.* Camp Crook, S. D., Weir.

Polyporus cryptopus Ellis.
On prairie. Kulm, July, 1909.
(Fungi Dak. *148.*)
Polyporus dichrous Fr.
On *Fraxinus lanceolata.* Ft. Ransom, Aug., 1916.
On *Populus tremuloides.* Camp Crook, S. D., July, 1912, Weir.
Polyporus elegans Bull.
On fallen branches. Mandan, Aug., 1915.
Polyporus gilvus (Schw.) Fr.
On *Quercus macrocarpa,* and *Prunus americana.* Fargo, Nov., 1915. Stevens.
(Fungi Dak. *411.*)
Polyporus spumeus Sow.
On *Populus angustifolia.* Camp Crook, S. D., 1912, Weir.
Polystictus conchifer Schw.
On log (*Ostrya virginica ?*). Power's ranch, Aug., 1916.
Polystictus hirsutus Wolf.
On *Quercus macrocarpa,* and *Prunus americana.* Kulm, Delaney's Ranch.
Polystictus pargamenus Fr.
On *Populus tremuloides.* Fargo, Ft. Ransom, Aug., 1916, Waldron, Stevens.
(Fungi Dak. *412.*)
Polystictus planus Peck.
On fallen twigs. Anselm, Aug., 1916.
Polystictus versicolor Fr.
On *Prunus americana* and *Quercus macrocarpa.* Kulm and Fargo, Waldron.
(Fungi Dak. *413, 413a.*)
Poria laminata Murr.
On *Prunus americana.* Fargo, Nov., 1916, Stevens.
Poria punctata Fr.
On *Tilia americana.* Anselm, Aug., 1916.
Russula emetica Fr.
On soil in woods. Anselm, Aug., 1916.
Schizophyllum commune Fr.
On *Acer Negundo.* Kulm, Nov., 1911 and Fargo, 1906, Waldron.
Secotium acuminatum Mont.
Waste places. Kulm, Aug., 1908 and Dickenson, Waldron.
(Fungi Dak. *49.*)
Stereum fasciatum Schw.
On *Populus tremuloides.* Camp Crook, S. D., 1912, Weir.
(Fungi Dak. *422.*)
Stereum frustulatum Fr.
On *Quercus macrocarpa.* Fargo, June, 1914.
Stereum purpureum Pers.
On *Acer Negundo.* Kulm, Camp Crook, S. D., Weir.
(Fungi Dak. *175.*)
Stereum rufum Fr.
On *Populus tremuloides.* Fargo, July, 1914.
(Fungi Dak. *279,* as *Hypocrea Richardsoni* Berk. & Mont.)

Stereum versicolor Fr.
Woods. Fargo, 1906, Waldron.
Thelephora cuticularis Berk.
On wood. Anselm, Aug., 1916.
Thelephora terrestris Ehrh.
On pine needles. Camp Crook, S. D., Weir.
(Fungi Dak. *423.*)
Trametes carnea Nees.
On *Pinus ponderosa.* Camp Crook, S. D., 1912, Weir.
Trametes hispida Bagl.
On *Populus deltoides.* Kulm, June, 1913.
On *Populus angustifolia.* Camp Crook, S. D., Weir.
Trametes setosus Weir.
On *Pinus ponderosa.* Camp Crook, S. D., June, 1912, Weir.
Trametes suaveolens Linn.
On *Populus tremuloides.* Camp Crook, S. D., 1912, Weir.
Tricholoma paedidum Fr.
In pasture. Kulm, July, 1914.
Tricholoma melaleucum Pers.
On soil under trees. Kulm, July, 1914.
Tricholoma equestre L. ?
On prairie. Kulm, Aug., 1910.
Tylostoma americanum.
Waste places. Dickenson, 1906, Waldron.
Tylostoma mammosum (Mich.) Fr.
Manure. Kulm, July, 1907.

V. FUNGI IMPERFECTI

Actinonema Rosae (Lib.) Fr.
On *Rosa heliophylla.* Fargo, Stevens.
Alternaria tenuis Nees.
On leaves of *Populus deltoides.* Kulm, Aug., 1914.
Botrytis vulgaris Link, var. *interrupta* Trans.
On galls of *Populus deltoides.* Kulm, Aug., 1913.
Cercospora Absinthii Sacc.
On *Artemisia Absinthium.* Kulm, Aug. 24, 1916.
(Fungi Dak. *402.*)
Cercospora Alismatis Ellis & Holw.
On *Alisma Plantago-aquatica.* Kulm, July, 1908.
Cercospora avicularis Wint.
On *Polygonum aviculare.* Kulm, July, 1908.
Cercospora Chenopodii Fres.
On *Chenopodium album,* and *C. rubrum.* Aug., 1908.
(Fungi Dak. *32, 194.*)
Cercospora circumscissa Sacc.
On *Prunus melanocarpa* and *P. americana.* Kulm, June, 1908.
(Fungi Dak. *31.*)
Cercospora elaeochroma Sacc. n. sp.
On *Asclepias speciosa.* Bismark, Aug., 1915.
(Fungi Dak. *354.*)

Cercospora dubia Fr.
On *Atriplex hastata*. Kulm, Aug., 1908.
Cercospora melanochaeta Ellis & Everh.
On *Celastrus scandens*. Delaney's Ranch, Aug., 1915.
Cercospora Pentstemonis Ellis & Kellerm.
On *Pentstemon grandiflorus*. Anselm, Aug., 1916, Stevens.
Cercospora Violae Sacc.
On *Viola papilionacea*. Kulm, July, 1913.
(Fungi Dak. *228*.)
Cercosporella Anethi Sacc. n. sp.
On *Anethum graveolens*. Kulm, Oct., 1914.
(Fungi Dak. *353*.)
Cicinnobolus Casatii DeBary.
On conidia. Kulm, July, 1912.
(Fungi Dak. *196*.)
Cladosporium graminum Corda, f. *caricicola* Sacc.
On *Carex festucacea*. Kulm, Aug., 1913.
Cladosporium Typharum Desm.
On *Typha latifolia*. Kulm, July, 1913.
Coniothecium Mollerianum Thüm.
On stems of *Aster multiflorus*. Kulm, July, 1913.
Colletotrichum Lindemuthianum (Sacc.) Bri. & Cav.
On *Phaseolus nanus*. Kulm, Aug., 1908.
Colletotrichum lineota Corda.
On *Andropogon furcatus*. Kulm, May, 1915.
Coryneum salicinum (Corda) Sacc.
On *Salix longifolia*. Kulm, Feb., 1913.
(Fungi Dak. *210*.)
Cylindrosporium Heraclei Ellis & Everh.
On *Heracleum lanatum*. Wirch Lake, June, 1910.
Cylindrosporium Toxicodendri (Curt.) Ellis & Everh.
On *Rhus radicans*. Kulm and Leeds, July, 1914, Lunell.
(Fungi Dak. *273*.)
Darluca filum (Bivon.) Cast.
On various uredinia. Kulm and Fargo, Stevens.
Didymaria Astragali Ellis & Holw.
On *Astragalus carolinianus*. Kulm, Aug., 1914.
Dinemasporium graminum (Lib.) Lev. var. *strigosulum* Karst
On old *Agropyron tenerum*. Kulm, July, 1913.
Dinemasporium hispidulum (Schrad.) Sacc.
On *Acer Negundo*. Kulm, Oct., 1914.
Ellisiella caudata Sacc.
On *Andropogon furcatus*. Kulm, July, 1914.
Epicoccum neglectum Desm.
On *Lotus americanus*. Kulm, June, 1915.
Fusarium cinnabarium Sacc.
On *Acer Negundo*. Kulm, Aug., 1910.
Fusarium Lini Bolley.
On *Linum usitatissimum*. Kulm, Aug., 1909.
(Fungi Dak. *55*.)

Fusicladium dentriticum Fuckel.

On apple and crab-apple leaves. Kulm and Garrison, Aug., 1915, Stevens. (Fungi Dak. *229*.)

Fusicoccum dakotense Sacc. & Syd. n. sp.

On *Prunus melanocarpa*. Kulm, May, 1913.

Gloeosporium septorioides Sacc.

On *Quercus macrocarpa*. Fargo, July, 1914.

Helminthosporium avenaceum Curt.

On *Avena sativa*. Kulm, Aug., 1914.

Helminthosporium Urtici = *H. Urticum* Peck.

On dead stems of *Urtica gracilis*. Kulm, Oct., 1916.

Forming dark brown, velutine spots, widely effused to completely covering sections of the stems.

Hyphae brown, erect, at first short, one or two septate, later proliferous, elongated and branched with many septa, to 300 μ long. Cells of the hyphae are often bulbous at the apex, 15 to 40 μ long, 3 to 6 μ in diameter, 6 to 8 μ at the bulbous apex. Cells are sometimes offset at the joints.

Conidia are abundant, cylindrical, rounded at ends, brown, 3-septate, minutely and obscurely warted, 16 to 30 $\times$ 6 to 9 μ.

Hendersonia arundinacea (Desm.) Sacc.

On *Phragmites communis*. Kulm, Nov., 1914.

Hendersonia Crataegi n. sp.

On leaves of *Crataegus mollis*. Fargo, Sept. and Oct., 1916, Stevens.

Causes irregular brown areas of various sizes outlined by the capillary veins.

Mature acervuli few, usually epiphyllus, on pallid spots, black, flattish, minute to 1/5 mm. in diameter, irregular in outline.

Sporules ovate-oblong, straight or somewhat curved, sooty tinted or black, 3-septate, rounded at the apex while the proximal cell is subacute and hyaline, with a pedicel sometimes attached, 14–22 $\times$ 5–7 μ. Pedicels hyaline up to 25 μ long.

Heterosporium tuberculans Ellis & Everh.

On *Iva xanthiifolia*. Kulm, Oct., 1908.
(Fungi Dak. *255*.)

Kellermania Sisyrinchii Ellis & Everh.

On *Sisyrinchium angustifolium*. Kulm, June, 1916.
(Fungi Dak. *383*.)

Leptotherium gentianaecolum (DC.) Beauml.

On *Gentiana Andrewsii*. Anselm, Aug., 1916.
(Fungi Dak. *385*.)

Macrophoma Brenckleana Sacc. & Syd. n. sp.

On *Salix longifolia*. Kulm, Feb., 1913.

Macrophoma smilacina (Peck) Bert. & Vogl.

On *Smilax herbacea*. Mandan, Aug., 1915.

Macrosporium fasciculatum Cooke & Ellis.

On *Phaseolus nanus*. Kulm, Aug., 1908.
(Fungi Dak. *56*.)

Macrosporium heteronemum Desm.

On *Robinia hispida* (in cult.). Kulm, Sept., 1914.
(Fungi Dak. *368*.)

Macrosporium parasiticum Thüm.
On *Ramularia Armoraciae* Fuckel. Kulm, Aug., 1914.
(Fungi Dak. *258.*)
Macrosporium tomato Cooke.
On garden tomato. Kulm, Aug., 1908.
Melanoconium cerasium Peck.
On *Prunus melanocarpa.* Kulm, May, 1913.
(Fungi Dak. *387.*)
Monilia angustior Reade.
On *Prunus melanocarpa.* Kulm, June, 1913.
(Fungi Dak. *335.*)
Nematogonum aurantiacum Desm.
On bark of apple tree. Kulm, May, 1914.
Ovularia lotophaga Ellis & Everh.
On *Lotus americanus.* Kulm, Aug., 1912.
(Fungi Dak. *195.*)
Ovularia obliqua (Cooke) Oud.
On *Rumex crispa.* Kulm, Aug., 1915.
Phoma leptospora Sacc. n. sp.
On *Grindelia squarrosa.* Kulm, July, 1913.
Phoma Astragali Cooke & Hark.
On *Astragalus goniatus.* Kulm, July, 1908.
(Fungi Dak. *145.*)
Phyllosticta Betae Oudem.
On *Beta vulgaris.* Kulm, July, 1915.
(Fungi Dak. *362.*)
Phyllosticta crataegicola Sacc.
On *Crataegus mollis.* Kulm, Aug., 1914.
Phyllosticta cruenta Kickx.
On *Smilacina stellata.* Kulm, July, 1908.
(Fungi Dak. *287.*)
Phyllosticta destruens Desm.
On *Prunus melanocarpa.* Kulm, Sept., 1914.
Phyllosticta ivaecola Ellis & Everh.
Iva xanthiifolia. Kulm, July, 1914.
(Fungi Dak. *338.*)
Phyllosticta Labrusca Thüm.
On *Ampelopsis quinquefolia.* Kulm, Aug., 1916.
(Fungi Dak. *393.*)
Phyllosticta viridis Ellis & Kellerm.
On *Fraxinus pennsylvanica.* Newell, S. D., Aug., 1912.
Phyllosticta viticola Thüm.
On *Vitis vulpina.* Ft. Ransom, Aug., 1916.
(Fungi Dak. *409.*)
Phyllosticta sp.
On *Sium cicutaefolium.* Kulm, July, 1912.
Placospaeria Galii Sacc.
On *Galium boreale.* Kulm, Sept., 1914.
(Fungi Dak. *363.*)

Polythrincium Trifolii Kuntze.
On *Trifolium repens*. Kulm, Sept., 1909.
On *Trifolium Michelianum*. Fargo, Aug., 1916, Stevens.
(Fungi Dak. *57*.)
Ramularia Armoraciae Fuckel.
On *Roripa Armoracia*. Kulm, Aug., 1914.
(Fungi Dak. *263*.)
Ramularia arvensis Sacc.
On *Potentilla pentandra*. Kulm, June, 1913.
Ramularia Celastri Ellis.
On *Celastrus scandens*. Kulm, Aug., 1908.
Ramularia Heraclei (Oud.) Sacc.
On *Heracleum lanatum*. Kulm, July, 1908.
(Fungi Dak. *69*.)
Ramularia montana Speg.
On *Epilobium coloratum*. Kulm, Aug., 1915.
Ramularia rufo-maculans Peck.
On *Polygonum emersum*. Kulm, Sept., 1914.
Ramularia Taraxaci Karst.
On *Taraxacum officinale*. Fargo, Oct., 1914, Stevens.
(Fungi Dak. *295*.)
Ramularia Urticae Ces.
On *Urtica gracilis*. Kulm, Aug., 1912.
(Fungi Dak. *200*.)
Septoria Astragali Rab.
On *Lathyrus venosus*. Ft. Ransom, Aug., 1916.
Septoria Brencklei Sacc. n. sp.
On *Echinocystis lobata*. Kulm, July, 1913.
(Fungi Dak. *247*, *247a*.)
Septoria bromigena Sacc. n. sp.
On *Bromus inermis*. Kulm, June, 1914.
(Fungi Dak. *319*.)
Septoria conspicua Ellis & Mart.
On *Steironema lanceolatum*. Fargo, Sept., 1914, Stevens.
Septoria Convolvuli Desm.
On *Convolvulus sepium*. Kulm and Fargo, Oct., 1914, Stevens.
(Fungi Dak. *265*.)
Septoria cornicola Desm.
On *Cornus stolonifera*. Ft. Ransom, Aug., 1916.
Septoria Crataegi Kickx.
On *Crataegus mollis*. Kulm, Oct., 1914, and Fargo, Sept., 1916, Stevens.
Septoria Fraxini Desm.
On *Fraxinus lanceolata*. Fargo, Sept., 1914, Stevens.
Septoria gaurina Ellis & Kellerm.
On *Gaura coccinea*. Kulm, June, 1909.
(Fungi Dak. *167*.)
Septoria Helianthi Ellis & Kellerm.
On *Helianthus annuus*. Kulm, July, 1914.
(Fungi Dak. *266*.)

Septoria irregularis Peck.
On *Pisum sativum*. Kulm, July, 1914.
Septoria Liatridis Ellis & Davis.
On *Liatris scariosa*. Kulm, June, 1914.
(Fungi Dak. *267*.)
Septoria littorea Sacc.
On *Apocynum cannqbinum*. Kulm, July, 1916.
Septoria malvicola Ellis & Mart.
On *Malva rotundifolia*. Fargo, Sept., 1915, Stevens.
(Fungi Dak. *395*.)
Septoria Oenotherae Westd.
On *Anogra pallida* and *Onagra stigosa*. Kulm, June, 1914.
(Fungi Dak. *268, 396*.)
Septoria peregrina Sacc. n. sp.
On *Conringia orientalis*. Kulm, July, 1915.
(Fungi Dak. *397*.)
Septoria Pisi West.
On *Pisum sativum*. Kulm, July, 1914.
(Fungi Dak. *269*.)
Septoria Polygonorum Desm.
Polygonum lapathifolium. Kulm, June, 1914.
(Fungi Dak. *270*.)
Septoria Pruni Ellis.
On *Prunus americana*. Fargo, Aug., 1915, Stevens.
Septoria psammophila Sacc. n. sp.
On *Astragalus pectinatus*. Lostwood, Aug., 1915, Stevens.
Septoria rhoina Sacc.
On *Rhus glabra*. Enderlin, Aug., 1916.
Septoria Ribis Desm.
On *Ribes rubrum, R. floridum*, and *R. Uva-crispa*. Kulm, July, 1914.
(Fungi Dak. *271*.)
Septoria Rudbeckiae Ellis & Hals.
On *Ratibida columnaris*. Kulm, July, 1915.
Septoria Rumicis Trail.
On *Rumex salicifolia*. Kulm and Fargo, June, 1915, Stevens.
Septoria Scrophulariae Peck.
On *Scrophularia leporella*. Ft. Ransom, Aug., 1916, Stevens.
(Fungi Dak. *398*.)
Septoria sibirica Thüm.
On *Ribes rubrum*. Kulm, July, 1914.
(Fungi Dak. *320*.)
Septoria Symphoricarpi Ellis & Everh.
On *Symphoricarpos occidentalis*. Kulm, Aug., 1914.
(Fungi Dak. *272*.)
Septoria Toxicodendri Curt.
On *Rhus radicans*. (See *Cylindrosporium Toxicodendri*.)
Septoria Xanthiifolia Ellis & Kellerm.
On *Iva xanthiifolia*. Kulm, July, 1914.
Septoria Ziziae Ellis & Everh.
On *Zizia cordata*. Kulm, July, 1914.

Sphaeropsis Clintonii Peck.
On *Acer Negundo*. Kulm, Apr., 1913.
(Fungi Dak. *218*.)
Sphaeropsis Peckii Sacc.
On *Prunus americana*. Fargo, July, 1914.
Sphaeropsis Rosarum Ellis & Everh.
On *Rosa blanda*. Kulm, May, 1914.
Sphaeropsis rubicola Cooke & Ellis.
On *Rubus strigosus*. Kulm, Apr., 1915.
Stagonospora Chenopodii Peck.
On *Chenopodium rubrum*. Kulm, Sept., 1914.
Stagonospora graminea Sacc.
On *Phragmites communis*. Kulm, Nov., 1914.
Stagonospora simplicior Sacc. & Briard.
On *Andropogon furcatus*. Kulm, July, 1914.
Stagonospora Smilacis (Ellis & Mort.) Sacc.
On *Smilax pulverulenta*. Fargo, Oct., 1916, Stevens.
Steirochaete Malvarum A. Br. & Casp.
On *Malva parviflora*. Kulm, July, 1912.
(Fungi Dak. *348*.)
Stemphylium botryosum Wats. var. *urocladium* Sacc.
On *Malvastrum coccineum*. Kulm, June, 1914.
Trimmatostroma Brencklei Sacc. n. sp.
On *Rosa heliophylla*. Kulm, June, 1914.
Trimmatostroma Salicis Corda.
On *Salix*. Kulm, June, 1912.
Tuberculina persicina Ditm.
On *Aecidiaceae*. Kulm and Leeds, July, 1913, Lunell.
Vermicularia dematium (Pers.) Fr.
On *Heracleum lanatum*. Beaver Lake, July, 1908.
Vermicularia dematium (Pers.) Fr. f. *minor* Sacc.
On *Taraxacum officinale*. Kulm, July, 1913.
(Fungi Dak. *400*.)

FORT DOUGLAS, UTAH.

NOTES AND BRIEF ARTICLES

Twenty-four new species and one new variety of *Inocybe* are described by Prof. G. F. Atkinson in the April number of the *American Journal of Botany*.

Dr. W. C. Coker, professor of botany in the State University of North Carolina, recently spent some time in the library of the New York Botanical Garden looking over mycological literature in connection with his work on the fungi of his state.

The *Bulletin* of the Torrey Botanical Club for April contains an article on "New Species of Uredineae" by Dr. J. C. Arthur, the paper being the tenth of the series under this title. While covering a wide range in North America, the majority of the species are from Mexico and Central America where the rust flora is much less known than in the North.

After an extended study of the spore development in *Philocopra coeruleotecta* Rehm, H. J. Sax in the *American Journal of Botany* for February concludes that the method of spore formation in the many-spored ascus is similar to that of the few-spored ascus. There is no indication of a phylogenetic relationship between the ascus and the sporangium of the phycomycetes.

In the January number of *Phytopathology*, L. M. Massey claims that a dust mixture consisting of 90 parts of sulphur and 10 parts of arsenate of lead is more effective in the control of powdery mildew of roses than a spray of lime-sulphur and is much less unsightly. The mixture acts both as a fungicide and an insecticide and is easier to handle than pure sulphur dust since the arsenate of lead keeps the sulphur from packing.

The *Annals* of the Missouri Botanical Garden for February contains a monograph of the genus *Rhizopogon* for North Amer-

ica. Twelve species and one variety are recognized, six of which are described as new. Fifteen extra-limital species are also described, two of which are listed as new. These are included in order to assist in determining material in case they are later found to occur in North America. The paper is illustrated with two plates.

The *Botanical Gazette* for May contains an article by J. C. Arthur on the "Uredinales of the Andes, Based on Collections by Dr. and Mrs. Rose." An estimate of the number of named species of rusts from the Andes is put at about 250, which is probably not half of the total number to be found. The Rose collection of Uredinales represents 40 numbers comprising 21 species of which about one fourth are described as new, a number rare, and one third common.

Professor H. H. Whetzel, leader of the plant-disease survey work of the state of New York in cooperation with the United States Department of Agriculture, is soliciting the collaboration of all institutions in the state which are interested in mycology or plant-disease work of any kind. The object of this work is to gain a detailed knowledge of the distribution and prevalence of the principal diseases of food-plants, which knowledge is to be used as a basis in waging a more intelligent campaign against such diseases and thereby increasing our food production.

THE PROPOSED ABSTRACT JOURNAL

A meeting of editors of botanical publications was held at Pittsburgh, on December 28, 1917, to consider the desirability of undertaking the publication of an abstracting journal for botany. After a long discussion the following resolution was adopted:

"*Resolved*, That we, as a group of botanists interested, invite each botanical society to appoint a committee of two to meet with committees of other societies and with the members of this group, to formulate a program for a journal of botanical abstracts, botany to be interpreted in its broadest sense. In case action of any society is delayed, the President and Secretary of such so-

citey are invited to represent it. A meeting is called for 10 a. m., December 30, at Parlor 140, Fort Pitt Hotel."

At this augmented meeting of December 30, after informal discussion, it was voted that the 26 botanists present proceed to formal organization under the "Temporary Board of Control of Botanical Abstracts." Donald Reddick was elected chairman and Forrest Shreve secretary. On motion it was voted that the board provide for its perpetuation in the following way:

1. That the following botanical organizations be asked to elect two members each:

American Association for the Advancement of Science, Section G.
American Genetic Association
American Microscopical Society
American Phytopathological Society
American Society of Agronomists
American Society of Naturalists
American Conference of Pharmaceutical Faculties
Botanical Society of America { General Section / Physiological Section / Taxonomic Section }
Ecological Society of America
Paleontological Society of America
Society of Horticultural Science
Society of American Bacteriologists
Society of American Foresters

2. That in the election of members to the Board of Control of Botanical Abstracts each society be asked to name one man for a short term of two years and one man for a long term of four years, and that a member be elected biennially thereafter or as required.

On motion the Temporary Board of Control elected by ballot an executive committee of ten on organization, to act for one year with power to make arrangements for editorial management and publication. This committee is constituted, as follows:

J. H. Barnhart	Burton E. Livingston
Henry C. Cowles	F. C. Newcombe
B. M. Duggar	Donald Reddick
C. Stuart Gager	C. L. Shear
R. A. Harper	Forrest Shreve

The executive committee of the Temporary Board of Control selected B. E. Livingston for editor-in-chief and the following as associate editors in charge of the sections as indicated:

Agronomy and Soil Technology, ———[1]
Bacteriology, H. J. Conn
Botanical Education, C. Stuart Gager
Cytology, C. J. Chamberlain
Ecology and Plant Geography, Henry C. Cowles
Forestry, Raphael Zon
Genetics, G. H. Shull
History, Biography and Bibliography, J. H. Barnhart
Horticulture, W. H. Chandler
Morphology, E. W. Sinnott
Paleobotany, E. W. Berry
Pathology, Donald Reddick
Pharmacognosy, Henry Kraemer
Physiology, B. M. Duggar
Taxonomy, J. M. Greenman and J. G. Schramm

It is expected that the work of abstracting will begin at once, with the international literature of the year 1918, and that publication will follow promptly.

[1] Name to be supplied.

INDEX TO AMERICAN MYCOLOGICAL LITERATURE

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